

Chapter 4

Rehabilitation

“Being an amputee myself with functional lower limb prosthetics, I can say that the device enable me to function normally. My prosthetics brought back my confidence and self esteem to participate in mainstream activities of the society, thus changing my outlook in life to positive to more positive. Definitely, my prosthetics had an impact on my present status or the quality of life I am enjoying now because I basically perform all the task that is assigned to me which at the end the day results to quality output and good pay.”

Johnny

“Coming from a country where there is not much awareness and resources for dealing with post-spinal cord injured victims, my return home was indeed an enormous challenge. Living in a house that was inaccessible, members of my family have had to persevere with daily lifting me up and down the house. Physiotherapy had become a crucial necessity and as a result of the continuous costs incurred, my mother took up the task to administer physiotherapy as well as stand in as my caretaker. During my rehabilitation process, getting admitted for treatment during times of illness or to use physiotherapy facilities was close to impossible as a result of the overwhelming numbers on the waiting list. My rehabilitation period despite challenging was a humbling moment of my life and a continuous process that I face until today. I have learned disability is not inability and a strong mentality and great attitude have been very important!”

Casey

“Families find themselves in difficulty after a member of the family has a stroke. I consider myself a stroke survivor but my family are stroke victims. I have been fortunate and have been able to return to work, but I have had to battle all the way. We do not get the help we need, services are so variable and there is not enough speech and language therapy and physiotherapy. After my stroke I had to learn to do everything again, including swallowing and to learn to talk. The first thing that came back to me with my speech was swearing, my first sentence had four expletives in it, but I am told that was normal.”

Linda

“If you don’t have a proper wheelchair, that is when you really feel that you are disabled. But if you have a proper wheelchair, which meets your needs and suits you, you can forget about your disability.”

Faustina

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Rehabilitation

Rehabilitation has long lacked a unifying conceptual framework (1). Historically, the term has described a range of responses to disability, from interventions to improve body function to more comprehensive measures designed to promote inclusion (see **Box 4.1**). The *International Classification of Functioning, Disability and Health* (ICF) provides a framework that can be used for all aspects of rehabilitation (11–14).

For some people with disabilities, rehabilitation is essential to being able to participate in education, the labour market, and civic life. Rehabilitation is always voluntary, and some individuals may require support with decision-making about rehabilitation choices. In all cases rehabilitation should help to empower a person with a disability and his or her family.

Article 26, Habilitation and Rehabilitation, of the United Nations *Convention on the Rights of Persons with Disabilities* (CRPD) calls for:

“... appropriate measures, including through peer support, to enable persons with disabilities to attain and maintain their maximum independence, full physical, mental, social and vocational ability, and full inclusion and participation in all aspects of life”.

The Article further calls on countries to organize, strengthen, and extend comprehensive rehabilitation services and programmes, which should begin as early as possible, based on multidisciplinary assessment of individual needs and strengths, and including the provision of assistive devices and technologies.

This chapter examines some typical rehabilitation measures, the need and unmet need for rehabilitation, barriers to accessing rehabilitation, and ways in which these barriers can be addressed.

Understanding rehabilitation

Rehabilitation measures and outcomes

Rehabilitation measures target body functions and structures, activities and participation, environmental factors, and personal factors. They contribute

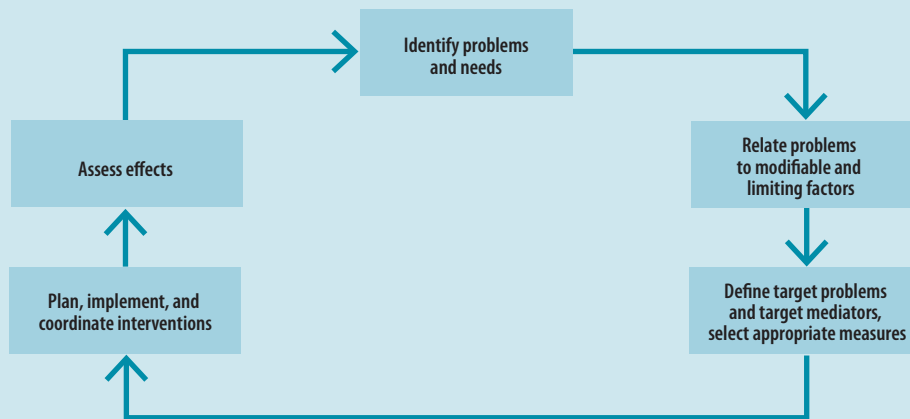
Box 4.1. What is rehabilitation?

This Report defines **rehabilitation** as “a set of measures that assist individuals who experience, or are likely to experience, disability to achieve and maintain optimal functioning in interaction with their environments”. A distinction is sometimes made between habilitation, which aims to help those who acquire disabilities congenitally or early in life to develop maximal functioning; and rehabilitation, where those who have experienced a loss in function are assisted to regain maximal functioning (2). In this chapter the term “rehabilitation” covers both types of intervention. Although the concept of rehabilitation is broad, not everything to do with disability can be included in the term. Rehabilitation targets improvements in individual functioning – say, by improving a person’s ability to eat and drink independently. Rehabilitation also includes making changes to the individual’s environment – for example, by installing a toilet handrail. But barrier removal initiatives at societal level, such as fitting a ramp to a public building, are not considered rehabilitation in this Report.

Rehabilitation reduces the impact of a broad range of health conditions. Typically rehabilitation occurs for a specific period of time, but can involve single or multiple interventions delivered by an individual or a team of rehabilitation workers, and can be needed from the acute or initial phase immediately following recognition of a health condition through to post-acute and maintenance phases.

Rehabilitation involves identification of a person’s problems and needs, relating the problems to relevant factors of the person and the environment, defining rehabilitation goals, planning and implementing the measures, and assessing the effects (see figure below). Educating people with disabilities is essential for developing knowledge and skills for self-help, care, management, and decision-making. People with disabilities and their families experience better health and functioning when they are partners in rehabilitation (3–9).

The rehabilitation process



Source: A modified version of the Rehabilitation Cycle from (10).

Rehabilitation – provided along a continuum of care ranging from hospital care to rehabilitation in the community (12) – can improve health outcomes, reduce costs by shortening hospital stays (15–17), reduce disability, and improve quality of life (18–21). Rehabilitation need not be expensive.

Rehabilitation is cross-sectoral and may be carried out by health professionals in conjunction with specialists in education, employment, social welfare, and other fields. In resource-poor contexts it may involve non-specialist workers – for example, community-based rehabilitation workers in addition to family, friends, and community groups.

Rehabilitation that begins early produces better functional outcomes for almost all health conditions associated with disability (18–30). The effectiveness of early intervention is particularly marked for children with, or at risk of, developmental delays (27, 28, 31, 32), and has been proven to increase educational and developmental gains (4, 27).

to a person achieving and maintaining optimal functioning in interaction with their environment, using the following broad outcomes:

- prevention of the loss of function
- slowing the rate of loss of function
- improvement or restoration of function
- compensation for lost function
- maintenance of current function.

Rehabilitation outcomes are the benefits and changes in the functioning of an individual over time that are attributable to a single measure or set of measures (33). Traditionally, rehabilitation outcome measures have focused on the individual's impairment level. More recently, outcomes measurement has been extended to include individual activity and participation outcomes (34, 35). Measurements of activity and participation outcomes assess the individual's performance across a range of areas – including communication, mobility, self-care, education, work and employment, and quality of life. Activity and participation outcomes may also be measured for programmes. Examples include the number of people who remain in or return to their home or community, independent living rates, return-to-work rates, and hours spent in leisure and recreational pursuits. Rehabilitation outcomes may also be measured through changes in resource use – for example, reducing the hours needed each week for support and assistance services (36).

The following examples illustrate different rehabilitation measures:

- **A middle-aged woman with advanced diabetes.** Rehabilitation might include assistance to regain strength following her hospitalization for diabetic coma, the provision of a prosthesis and gait training after a limb amputation, and the provision of screen-reader software to enable her to continue her job as an accountant after sustaining loss of vision.
- **A young man with schizophrenia.** The man may have trouble with routine daily tasks, such as working, living independently, and

maintaining relationships. Rehabilitation might mean drug treatment, education of patients and families, and psychological support via outpatient care, community-based rehabilitation, or participation in a support group.

- **A child who is deafblind.** Parents, teachers, physical and occupational therapists, and other orientation and mobility specialists need to work together to plan accessible and stimulating spaces to encourage development. Caregivers will need to work with the child to develop appropriate touch and sign communication methods. Individualized education with careful assessment will help learning and reduce the child's isolation.

Limitations and restrictions for a child with cerebral palsy, and possible rehabilitation measures, outcomes, and barriers are described in [Table 4.1](#).

Rehabilitation teams and specific disciplines may work across categories. Rehabilitation measures in this chapter are broadly divided into three categories:

- rehabilitation medicine
- therapy
- assistive technologies.

Rehabilitation medicine

Rehabilitation medicine is concerned with improving functioning through the diagnosis and treatment of health conditions, reducing impairments, and preventing or treating complications (12, 37). Doctors with specific expertise in medical rehabilitation are referred to as physiatrists, rehabilitation doctors, or physical and rehabilitation specialists (37). Medical specialists such as psychiatrists, paediatricians, geriatricians, ophthalmologists, neurosurgeons, and orthopaedic surgeons can be involved in rehabilitation medicine, as can a broad range of therapists. In many parts of the world where specialists in rehabilitation medicine are not available, services may be provided by doctors and therapists (see [Box 4.2](#)).

Table 4.1. Child with cerebral palsy and rehabilitation

Difficulties faced by the child	Rehabilitation measures	Possible outcomes	Potential barriers	People involved in the measures
<p>Unable to care for self</p> <ul style="list-style-type: none"> ▶ Therapy <ul style="list-style-type: none"> – Training for the child on different ways to complete the task. – Assessment and provision of equipment, training parents to lift, carry, move, feed and otherwise care for the child with cerebral palsy. – Teaching parents and family members to use and maintain equipment. – Provision of information and support for parents and family. ▶ Assistive technology <ul style="list-style-type: none"> – Provision of equipment for maintaining posture and self-care, playing and interaction, such as sitting or standing (when age-appropriate) 	<ul style="list-style-type: none"> – Parents better able to care for their child and be proactive. – Reduced likelihood of compromised development, deformities, and contractures. – Reduced likelihood of respiratory infections. – Access to support groups or peer support. – Coping with stress and other psychological demands. – Better posture, respiration, feeding, speech, and physical activity performance. 	<ul style="list-style-type: none"> – Timeliness of interventions. – Availability of family and support. – Financial capacity to pay for services and equipment. – Availability of well trained staff. – Attitudes and understanding of others involved in the rehabilitation measure. – Physical access to home environment, community, equipment, assistive devices and services. 	<ul style="list-style-type: none"> – The child, parents, siblings, and extended family. – Depending on the setting and resources available: physiotherapists, occupational therapists, speech and language therapists, orthotists and technicians, doctors, psychologists, social workers, community-based rehabilitation workers, schoolteachers, teaching assistants. 	
<p>Difficulty walking</p> <ul style="list-style-type: none"> ▶ Rehabilitation medicine <ul style="list-style-type: none"> – <i>Botulinum</i> toxin injections. – Surgical treatment of contractures and deformities (therapy interventions usually complement these medical interventions). ▶ Therapy <ul style="list-style-type: none"> – Therapy, exercises and targeted play activities to train effective movements. ▶ Assistive technology <ul style="list-style-type: none"> – Orthotics, wheelchair or other equipment. 	<ul style="list-style-type: none"> – Decreased muscle tone, better biomechanics of walking. – Decrease in self-reported limitations. – Increased participation in education and social life. 	<ul style="list-style-type: none"> – Access to post-acute rehabilitation. 	<ul style="list-style-type: none"> – Doctor, parents, therapist, orthotist. 	
<p>Communication difficulties</p> <ul style="list-style-type: none"> ▶ Therapy <ul style="list-style-type: none"> – Audiology. – Activities for language development. – Conversation skills. – Training conversation partners. ▶ Assistive technology <ul style="list-style-type: none"> – Training to use and maintain aids and equipment, which may include hearing aids and augmentative and alternative communication devices. 	<ul style="list-style-type: none"> – Better communication skills. – Participation in social, educational and occupational life opportunities. – Improved relationships with family, friends, and the wider community. – Reduced risk of distress, educational failure, and antisocial behaviour. 	<ul style="list-style-type: none"> – Availability of speech language therapists. – Social and economic status of the family. – Costs of purchasing and maintaining devices. 	<ul style="list-style-type: none"> – Parents, speech and language pathologist/therapist, communication disorders assistant, community-based rehabilitation worker, teachers, and assistants. 	

Note: The table shows some potential rehabilitation measures for a child with cerebral palsy, possible outcomes, potential barriers, and the various people involved in care.

Box 4.2. Clubfoot treatment in Uganda

Clubfoot, a congenital deformity involving one or both feet, is commonly neglected in low and middle-income countries. If left untreated, clubfoot can result in physical deformity, pain in the feet, and impaired mobility, all of which can limit community participation, including access to education.

In Uganda the incidence of clubfoot is 1.2 per 1000 live births. The condition is usually not diagnosed, or if diagnosed it is neglected because conventional invasive surgery treatment is not possible with the resources available (38).

The Ponseti clubfoot treatment involving manipulation, casting, Achilles tenotomy, and fitting of foot braces has proven to result in a high rate of painless, functional feet (Ponseti, 1996). The benefits of this approach for developing countries are low cost, high effectiveness, and the possibility to train service providers other than medical doctors to perform the treatment. The results of a clubfoot project in Malawi, where the treatment was conducted by trained orthopaedic clinical officers, showed that initial good correction was achieved in 98% of cases (39).

The Ugandan Sustainable Clubfoot Care Project – a collaborative partnership between the Ugandan Ministry of Health, CBM International, and Ugandan and Canadian universities – is funded by the Canadian International Development Agency. Its purpose is to make sustainable, universal, effective, and safe treatment of clubfoot in Uganda using the Ponseti method. It built on the existing health care and education sectors and has incorporated research to inform the project's activities and evaluate outcomes.

The project has resulted in many positive achievements in two years including:

- The Ugandan Ministry of Health has approved the Ponseti method as the preferred treatment for clubfoot in all its hospitals.
- 36% of the country's public hospitals have built the capacity to do the Ponseti procedure and are using the method.
- 798 health-care professionals received training to identify and treat clubfoot.
- Teaching modules on clubfoot and the Ponseti method are being used in two medical and three paramedical schools.
- 1152 students in various health disciplines received training in the Ponseti method.
- 872 children with clubfoot received treatment, an estimated 31% of infants born with clubfoot during the sample period – very high, given that only 41% of all births occur in a health care centre.
- Public awareness campaigns were implemented – including radio messages and distribution of posters and pamphlets to village health teams – to inform the general public that clubfoot is correctable.

The project shows that clubfoot detection and treatment can quickly be incorporated into settings with few resources. The approach requires:

- Screening infants at birth for foot deformity to detect the impairment.
- Building the capacity of health-care professionals across the continuum of care, from community midwives screening for deformity, to NGO technicians making braces, and orthopaedic officers performing tenotomies.
- Decentralizing clubfoot care services, including screening in the community, for example through community-based rehabilitation workers, and treatment in local clinics, to address treatment adherence barriers.
- Incorporating Ponseti method training into the education curricula of medical, nursing, paramedical, and infant health-care students.
- Establishing mechanisms to address treatment adherence barriers including travel distance and costs.

Rehabilitation medicine has shown positive outcomes, for example, in improving joint and limb function, pain management, wound healing, and psychosocial well-being (40–47).

Therapy

Therapy is concerned with restoring and compensating for the loss of functioning, and preventing or slowing deterioration in functioning in every area of a person's life. Therapists and rehabilitation workers include occupational therapists, orthotists, physiotherapists, prosthetists, psychologists, rehabilitation and technical assistants, social workers, and speech and language therapists.

Therapy measures include:

- training, exercises, and compensatory strategies
- education
- support and counselling

- modifications to the environment
- provision of resources and assistive technology.

Convincing evidence shows that some therapy measures improve rehabilitation outcomes (see **Box 4.3**). For example, exercise therapy in a broad range of health conditions – including cystic fibrosis, frailness in elderly people, Parkinson disease, stroke, osteoarthritis in the knee and hip, heart disease, and low back pain – has contributed to increased strength, endurance, and flexibility of joints. It can improve balance, posture, and range of motion or functional mobility, and reduce the risk of falls (49–51). Therapy interventions have also been found to be suitable for the long-term care of older persons to reduce disability (18). Some studies show that training in activities of daily living have positive outcomes for people with stroke (52).

Box 4.3. Money well spent: The effectiveness and value of housing adaptations

Public spending on housing adaptations for people with difficulties in functioning in the United Kingdom of Great Britain and Northern Ireland amounted to more than £220 million in 1995, and both the number of demands and unit costs are growing. A 2000 research study examined the effectiveness of adaptations in England and Wales, using interviews with recipients of major adaptations, postal questionnaires returned by recipients of minor adaptations, administrative records, and the views of visiting professionals. The main measure of “effectiveness” was the degree to which the problems experienced by the respondent before adaptation were overcome by the adaptation, without causing new problems. The study found that:

- Minor adaptations (rails, ramps, over-bath showers, and door entry systems, for example) – most costing less than £500 – produced a range of lasting, positive consequences for virtually all recipients: 62% of respondents suggested they felt safer from the risk of accident, and 77% perceived a positive effect on their health.
- Major adaptations (bathroom conversions, extensions, lifts, for example) in most cases had transformed people's lives. Before adaptations, people used words like “prisoner”, “degraded”, and “afraid” to describe their situations; following adaptations, they spoke of themselves as “independent”, “useful”, and “confident”.
- Where major adaptations failed, it was typically because of weaknesses in the original specification. Adaptations for children sometimes failed to allow for the child's growth, for example. In other cases, policies intended to save money resulted in major waste. Examples included extensions that were too small or too cold to use, and cheap but ineffective substitutes for proper bathing facilities.
- The evidence from recipients suggests that successful adaptations keep people out of hospitals, reduce strain on carers, and promote social inclusion.
- Benefits were most pronounced where careful consultation with users took place, where the needs of the whole family had been considered, and where the integrity of the home had been respected.

Adaptations appear to be a highly effective use of public resources, justifying investment in health and rehabilitation resources. Further research is needed in diverse contexts and settings.

Source (48).

Distance training was used in Bangladesh for mothers of children with cerebral palsy in an 18-month therapy programme: it promoted the development of physical and cognitive skills and improved motor skills in the children (53). Counselling, information, and training on adaptive methods, aids, and equipment have been effective for individuals with spinal cord injury and younger people with disabilities (54–56). Many rehabilitation measures help people with disabilities to return or continue to work, including adjusting the content or schedule of work, and making changes to equipment and the work environment (57, 58).

Assistive technologies

An assistive technology device can be defined as “any item, piece of equipment, or product, whether it is acquired commercially, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities” (59).

Common examples of assistive devices are:

- crutches, prostheses, orthoses, wheelchairs, and tricycles for people with mobility impairments;
- hearing aids and cochlear implants for those with hearing impairments;
- white canes, magnifiers, ocular devices, talking books, and software for screen magnification and reading for people with visual impairments;
- communication boards and speech synthesizers for people with speech impairments;
- devices such as day calendars with symbol pictures for people with cognitive impairment.

Assistive technologies, when appropriate to the user and the user’s environment, have been shown to be powerful tools to increase independence and improve participation. A study of people with limited mobility in Uganda found that assistive technologies for mobility created greater possibilities for community participation, especially in education and employment

(60). For people in the United Kingdom with disabilities resulting from brain injuries, technologies such as personal digital assistants, and simpler technologies such as wall charts, were closely associated with independence (61). In a study of Nigerians with hearing impairments, provision of a hearing aid was associated with improved function, participation and user satisfaction (62).

Assistive devices have also been reported to reduce disability and may substitute or supplement support services – possibly reducing care costs (63). In the United States of America, data over 15 years from the National Long-Term Care Survey found that increasing use of technology was associated with decreasing reported disability among people aged 65 years and older (64). Another study from the United States showed that users of assistive technologies such as mobility aids and equipment for personal care reported less need for support services (65).

In some countries, assistive devices are an integral part of health care and are provided through the national health care system. Elsewhere, assistive technology is provided by governments through rehabilitation services, vocational rehabilitation, or special education agencies (66), insurance companies, and charitable and nongovernmental organizations.

Rehabilitation settings

The availability of rehabilitation services in different settings varies within and across nations and regions (67–70). Medical rehabilitation and therapy are typically provided in acute care hospitals for conditions with acute onset. Follow-up medical rehabilitation, therapy, and assistive devices could be provided in a wide range of settings, including specialized rehabilitation wards or hospitals; rehabilitation centres; institutions such as residential mental and nursing homes, respite care centres, hospices, prisons, residential educational institutions, and military residential settings; or single or multiprofessional practices (office or clinic). Longer-term rehabilitation may be provided

within community settings and facilities such as primary health care centres, schools, workplaces, or home-care therapy services (67–70).

Needs and unmet needs

Global data on the need for rehabilitation services, the type and quality of measures provided, and estimates of unmet need do not exist. Data on rehabilitation services are often incomplete and fragmented. When data are available, comparability is hampered by differences in definitions, classifications of measures and personnel, populations under study, measurement methods, indicators, and data sources – for example, individuals with disabilities, service providers, or programme managers may experience needs and demands differently (71, 72).

Unmet rehabilitation needs can delay discharge, limit activities, restrict participation, cause deterioration in health, increase dependency on others for assistance, and decrease quality of life (37, 73–77). These negative outcomes can have broad social and financial implications for individuals, families, and communities (78–80).

Despite acknowledged limitations such as the quality of data and cultural variations in perception of disabilities, the need for rehabilitation services can be estimated in several ways. These include data on the prevalence of disability; disability-specific surveys; and population and administrative data.

Prevalence data on health conditions associated with disability can provide information to assess rehabilitation needs (81). As Chapter 2 indicated, disability rates correlate with the increase in noncommunicable conditions and global ageing. The need for rehabilitation services is projected to increase (82, 83) due to these demographic and epidemiological factors. Strong evidence suggests that impairments related to ageing and many health conditions can be reduced and functioning improved with rehabilitation (84–86).

Higher rates of disability indicate a greater potential need for rehabilitation. Epidemiologi-

cal evidence together with an examination of the number, type, and severity of impairments, and the activity limitations and participation restrictions that may benefit from various rehabilitation measures, can help measure the need for services and may be useful for setting appropriate priorities for rehabilitation (87).

- The number of people needing hearing aids worldwide is based on 2005 World Health Organization estimates that about 278 million people have moderate to profound hearing impairments (88). In developed countries, industry experts estimate that about 20% of people with hearing impairments need hearing aids (89), suggesting 56 million potential hearing-aid users worldwide. Hearing aid producers and distributors estimate that hearing aid production currently meets less than 10% of global need (88), and less than 3% of the hearing aid needs in developing countries are met annually (90).
- The International Society for Prosthetics and Orthotics and the World Health Organization have estimated that people needing prostheses or orthotics and related services represent 0.5% of the population in developing countries; and 30 million people in Africa, Asia, and Latin America (91) require an estimated 180 000 rehabilitation professionals. In 2005 there were 24 prosthetic and orthotic schools in developing countries, graduating 400 trainees annually. Worldwide existing training facilities for prosthetic and orthotic professionals and other providers of essential rehabilitation services are deeply inadequate in relation to the need (92).
- A national survey of musculoskeletal impairment in Rwanda concluded that 2.6% of children are impaired and that about 80 000 need physical therapy, 50 000 need orthopaedic surgery, and 10 000 need assistive devices (93).

Most of the available data on national supply and unmet need are derived from

disability-specific surveys on specific populations such as:

- National studies on living conditions of people with disabilities conducted in Malawi, Mozambique, Namibia, Zambia, and Zimbabwe (94–98) revealed large gaps in the provision of medical rehabilitation and assistive devices (see **Table 2.5** in Chapter 2). Gender inequalities in access to assistive devices were evident in Malawi (men 25.3% and women 14.1%) and Zambia (men 15.7% and women 11.9%) (99).
- A survey of physical rehabilitation medicine in Croatia, the Czech Republic, Hungary, Slovakia, and Slovenia found a general lack of access to rehabilitation in primary, secondary, tertiary, and community health care settings, as well as regional and socioeconomic inequalities in access (100).
- In a study of people identified as disabled from three districts in Beijing, China, 75% of those interviewed expressed a need for a range of rehabilitation services, of which only 27% had received such services (101). A national Chinese study of the need for rehabilitation in 2007 found that unmet need was particularly high for assistive devices and therapy (102).
- United States surveys report considerable unmet needs – often caused by funding problems – for assistive technologies (103).

Unmet need for rehabilitation services can also be estimated from administrative and population survey data. The supply of rehabilitation services can be estimated from administrative data on the provision of services, and measures such as waiting times for rehabilitation services can proxy the extent to which demand for services is being met.

A recent global survey (2006–2008) of vision services in 195 countries found that waiting times in urban areas averaged less than one month, while waiting times in rural areas ranged from six months to a year (104). Proxy measures may not always be reliable. In the case of waiting times, for instance, lack of awareness of services and beliefs about disability influence

treatment-seeking, while restrictions on who is legitimately waiting for services can complicate data interpretation (105–107).

Indicators on the number of people demanding but not receiving services, or receiving inadequate or inappropriate services, can provide useful planning information (108). Data on rehabilitation often are not disaggregated from other health care services, however, and rehabilitation measures are not included in existing classification systems, which could provide a framework for describing and measuring rehabilitation. Administrative data on supply are often fragmented because rehabilitation can take place in a variety of settings and be performed by different personnel.

Comparing multiple data sources can provide more robust interpretations, if a common framework like the ICF is used. As an example, the Arthritis Community Research and Evaluation Unit in Toronto merged administrative data sources to profile rehabilitation demand and supply across all regions of the province of Ontario (109). The researchers triangulated population data with the number of health-care workers per region to estimate the number of workers per person: they found that the higher concentration of workers in the southern region did not coincide with the highest areas of demand, causing unmet demand for rehabilitation.

Addressing barriers to rehabilitation

The barriers to rehabilitation service provision can be overcome through a series of actions, including:

- reforming policies, laws, and delivery systems, including development or revision of national rehabilitation plans;
- developing funding mechanisms to address barriers related to financing of rehabilitation;

- increasing human resources for rehabilitation, including training and retention of rehabilitation personnel;
- expanding and decentralizing service delivery;
- increasing the use and affordability of technology and assistive devices;
- expanding research programmes, including improving information and access to good practice guidelines.

Reforming policies, laws, and delivery systems

A 2005 global survey (110) of the implementation of the nonbinding, United Nations *Standard Rules on the Equalization of Opportunities for Persons with Disabilities* found that:

- in 48 of 114 (42%) countries that responded to the survey, rehabilitation policies were not adopted;
- in 57 (50%) countries legislation on rehabilitation for people with disabilities was not passed;
- in 46 (40%) countries rehabilitation programmes were not established.

Many countries have good legislation and related policies on rehabilitation, but the implementation of these policies, and the development and delivery of regional and local rehabilitation services, have lagged. Systemic barriers include:

- **Lack of strategic planning.** A study of rehabilitation medicine related to physical impairments – excluding assistive technology, sensory impairments, and specialized disciplines – in five central and eastern European countries suggested that the lack of strategic planning for services had resulted in an uneven distribution of service capacity and infrastructure (100).
- **Lack of resources and health infrastructure.** Limited resources and health infrastructure in developing countries, and in rural and remote communities in developed

countries, can reduce access to rehabilitation and quality of services (111). In a survey on the reasons for not using needed health facilities in two Indian states, 52.3% of respondents indicated that no health-care facility in the area was available (112). Other countries lack rehabilitation services that have proven effective at reducing long-term costs, such as early intervention for children under the age of 5 (5, 113–115). A study of users of community-based rehabilitation (CBR) in Ghana, Guyana, and Nepal showed limited impact on physical well-being because CBR workers had difficulties providing physical rehabilitation, assistive devices, and referral services (116). In Haiti, before the 2010 earthquake, an estimated three quarters of amputees received prosthetic management due to the lack of availability of services (117).

- **Lack of agency responsible to administer, coordinate, and monitor services.** In some countries all rehabilitation is integrated in health care and financed under the national health system (118, 119). In other countries responsibilities are divided between different ministries, and rehabilitation services are often poorly integrated into the overall system and not well coordinated (120). A report of 29 African countries found that many lack coordination and collaboration among the different sectors and ministries involved in disability and rehabilitation, and 4 of the 29 countries did not have a lead ministry (119).
- **Inadequate health information systems and communication strategies** can contribute to low rates of participation in rehabilitation. Aboriginal Australians have high rates of cardiovascular disease but low rates of participation in cardiac rehabilitation, for example. Barriers to rehabilitation include poor communication across the health care sector and between providers (notably between primary and secondary care), inconsistent and insufficient data collection processes, multiple clinical information systems,

and incompatible technologies (121). Poor communication results in ineffective coordination of responsibilities among providers (75).

- **Complex referral systems can limit access.** Where access to rehabilitation services is controlled by doctors (77), medical rules or attitudes of primary physicians can obstruct individuals with disabilities from obtaining services (122). People are sometimes not referred, or inappropriately referred, or unnecessary medical consultations may increase their costs (123–126). This is particularly relevant to people with complex needs requiring multiple rehabilitation measures.
- **Absence of engagement with people with disabilities.** The study of 114 countries mentioned above did not consult with disabled people's organizations in 51 countries, and did not consult with families of persons with disabilities about design, implementation, and evaluation of rehabilitation programmes in 57 of the study countries (110).

Countries that lack policies and legislation on rehabilitation should consider introducing them, especially countries that are signatories to the CRPD, as they are required to align national law with Articles 25 and 26 of the Convention. Rehabilitation can be incorporated into general legislation on health, and into relevant employment, education, and social services legislation, as well as into specific legislation for persons with disabilities.

Policy responses should emphasize early intervention and use of rehabilitation to enable people with a broad range of health conditions to improve or maintain their level of functioning, with a specific focus on ensuring participation and inclusion, such as continuing to work (127). Services should be provided as close as possible to communities where people live, including in rural areas (128).

Development, implementation, and monitoring of policy and laws should include users (see [Box 4.4](#)) (132). Rehabilitation professionals

must be aware of the policies and programmes given the role of rehabilitation in keeping people with disabilities participating in society (133, 134).

National rehabilitation plans and improved collaboration

Creating or amending national plans on rehabilitation, and establishing infrastructure and capacity to implement the plan are critical to improving access to rehabilitation. Plans should be based on analysis of the current situation, consider the main aspects of rehabilitation provision – leadership, financing, information, service delivery, products and technologies, and the rehabilitation workforce (135) – and define priorities based on local need. Even if it is not immediately possible to provide rehabilitation services for all who need them, a plan involving smaller, annual investments may progressively strengthen and expand the rehabilitation system.

Successful implementation of the plan depends on establishing or strengthening mechanisms for intersectoral collaboration. An interministerial committee or agency for rehabilitation can coordinate across organizations. For example, a Disability Action Council with representatives from the government, NGOs, and training programmes was established in Cambodia in 1997, to support coordination and cooperation across rehabilitation providers, decrease duplication and improve distribution of services and referral systems, and promote joint ventures in training (136). The Council has been very successful in developing physical rehabilitation and supporting professional training (physical therapy, prosthetics, orthotics, wheelchairs, and CBR) (137). Further benefits include (136):

- joint negotiation for equipment and supplies;
- sharing knowledge and expertise;
- continuing education through sharing specialist educators, establishing clinical education sites, reviewing and revising curricula, and disseminating information;

Box 4.4. Reform of mental health law in Italy – closing psychiatric institutions is not enough

In 1978 Italy introduced Law No. 180 gradually phasing out psychiatric hospitals and introducing a community-based system of psychiatric care. Social psychiatrist Franco Basaglia was a leading figure behind the new law that rejected the assumption that people with mental illness were a danger to society. Basaglia had become appalled by the inhuman conditions he witnessed as the director of a psychiatric hospital in northern Italy. He viewed social factors as the main determinants in mental illness, and became a champion of community mental health services and beds in general hospitals instead of psychiatric hospitals (129).

Thirty years later, Italy is the only country where traditional mental hospitals are prohibited by law. The law comprised framework legislation, with individual regions tasked with implementing detailed norms, methods, and timetables for action. As a result of the law, no new patients were admitted to psychiatric hospitals, and a process of deinstitutionalization of psychiatric inpatients was actively promoted. The inpatient population dropped by 53% between 1978 and 1987, and the final dismantling of psychiatric hospitals was completed by 2000 (130).

Treatment for acute problems is delivered in general hospital psychiatric units, each with a maximum of 15 beds. A network of community mental health and rehabilitation centres support mentally ill people, based on a holistic perspective. The organization of services uses a departmental model to coordinate a range of treatments, phases, and professionals. Campaigns against stigma, for social inclusion of people with mental health problems, and empowerment of patients and families have been promoted and supported centrally and regionally.

As a consequence of these policies, Italy has fewer psychiatric beds than other countries – 1.72 per 10 000 people in 2001. While Italy has a comparable number of psychiatrists per head of population to the United Kingdom, it has one third the psychiatric nurses and psychologists, and one tenth of the social workers. Italy also has lower rates of compulsory admissions (2.5 per 10 000 people in 2001, compared with 5.5 per 10 000 in England) (131), and lower use of psychotropic drugs than other European countries. “Revolving door” readmissions are evident only in regions with poor resources.

Yet Italian mental health care is far from perfect (130). In place of public sector mental hospitals, the government operates small, protected communities or apartments for long-term patients, and private facilities provide long-term care in some regions. But support for mental health varies significantly by region, and the burden of care still falls on families in some areas. Community mental health and rehabilitation services have in some areas failed to innovate, and optimal treatments are not always available. Italy is preparing a new national strategy to reinforce the community care system, face emerging priorities, and standardize regional mental health care performance.

Italy’s experience shows that closing psychiatric institutions must be accompanied by alternative structures. Reform laws should provide minimum standards, not just guidelines. Political commitment is necessary, as well as investment in buildings, staff, and training. Research and evaluation is vital, together with central mechanisms for verification, control, and comparison of services.

- support for the transition from expatriate professional services to local management.

Developing funding mechanisms for rehabilitation

The cost of rehabilitation can be a barrier for people with disabilities in high-income as well as low-income countries. Even where funding from governments, insurers, or NGOs is available, it may not cover enough of the costs to make rehabilitation affordable (117). People

with disabilities have lower incomes and are often unemployed, so are less likely to be covered by employer-sponsored health plans or private voluntary health insurance (see Chapter 8). If they have limited finances and inadequate public health coverage, access to rehabilitation may also be limited, compromising activity and participation in society (138).

Lack of financial resources for assistive technologies is a significant barrier for many (101). People with disabilities and their families purchase more than half of all assistive devices directly (139). In a

national survey in India, two thirds of the assistive technology users reported having paid for their devices themselves (112). In Haiti, poor access to prosthetic services was attributed partially to users being unable to pay (117).

Spending on rehabilitation services is difficult to determine because it generally is not disaggregated from other health care expenditure. Limited information is available on expenditure for the full range of rehabilitation measures (68, 74, 138). Governments in 41 of 114 countries did not provide funding for assistive devices in 2005 (110). Even in the 79 countries where insurance schemes fully or partially covered assistive devices, 16 did not cover poor people with disabilities, and 28 did not cover all geographical locations (110). In some cases existing programmes did not cover maintenance and repairs for assistive devices, which can leave individuals with defective equipment and limit its use (76, 112, 140). One third of the 114 countries providing data to the 2005 global study did not allocate specific budgets for rehabilitation services (110). OECD countries appear to be investing more in rehabilitation than in the past, but the spending is still low (120). For example, unweighted averages for all OECD countries between 2006 and 2008 indicate that public spending on rehabilitation as part of labour market programmes was 0.02% of GDP with no increase over time (127).

Health care funding often provides selective coverage for rehabilitation services – for example, by restricting the number or type of assistive devices, the number of therapy visits over a specific time, or the maximum cost (77) – in order to control cost. While cost controls are needed, they should be balanced with the need to provide services to those who can benefit. In the United States, government and private insurance plans limit coverage of assistive technologies and may not replace ageing devices until they are broken, sometimes requiring a substantial waiting period (77). A study of assistive device use by people with rheumatic disease in Germany and the

Netherlands found significant differences between the two countries, thought to result from differences in country-related health care systems with respect to prescription and reimbursement rules (141).

Policy actions require a budget matching the scope and priorities of the plan. The budget for rehabilitation services should be part of the regular budgets of relevant ministries – notably health – and should consider ongoing needs. Ideally, the budget line for rehabilitation services would be separated to identify and monitor spending.

Many countries – particularly low-income and middle-income countries – struggle to finance rehabilitation, but rehabilitation is a good investment because it builds human capital (36, 142). Financing strategies can improve the provision, access, and coverage of rehabilitation services, particularly in low-income and middle-income countries. Any new strategy should be carefully evaluated for its applicability and cost-effectiveness before being implemented. Financing strategies may include the following:

- **Reallocate or redistribute resources.** Public rehabilitation services should be reviewed and evaluated, with resources reallocated effectively. Possible modifications include:
 - changing from hospital or clinic-based rehabilitation to community-based interventions (74, 83);
 - reorganizing and integrating services to make them more efficient (26, 74, 143);
 - relocating equipment to where it is most needed (144).
- **Cooperate internationally.** Developed countries, through their development aid, could provide long-term technical and financial assistance to developing countries to strengthen rehabilitation services, including rehabilitation personnel development. Aid agencies from Australia, Germany, Italy, Japan, New Zealand, Norway, Sweden, the United Kingdom, and the United States have supported such activities (145–147).

- **Include rehabilitation services in foreign aid for humanitarian crises.** Conflict and natural disaster cause injuries and disabilities and make people with existing disabilities even more vulnerable – for example, after an earthquake there are increased difficulties in moving around due to the rubble from collapsed buildings and the loss of mobility devices. Foreign aid should also include trauma care and rehabilitation services (135, 142, 148).
- **Combine public and private financing.** Clear demarcation of responsibilities and good coordination among sectors is needed for this strategy to be effective. Some services could be publicly funded but privately provided – as in Australia, Cambodia, Canada, and India.
- **Target poor people with disabilities.** The essential elements of rehabilitation need to be identified, publicly funded, and made available for free to people with low incomes, as in South Africa (149) and India (8).
- **Evaluate coverage of health insurance, including criteria for equitable access.** A study in the United States on access to physical therapy found that health care funding sources provided different coverage for physical therapy services depending on whether people had cerebral palsy, multiple sclerosis, or spinal cord injury (74).

Increasing human resources for rehabilitation

Global information about the rehabilitation workforce is inadequate. In many countries national planning and review of human resources for health do not refer to rehabilitation (135). Many lack the technical capacity to accurately monitor their rehabilitation workforce, so data are often unreliable and out-of-date. Furthermore, the terms to describe the workers vary, proven analytical tools are absent, and skills and experience for assessing crucial policy issues are lacking (150, 151).

Many countries, developing and developed, report inadequate, unstable, or nonexistent supplies, (83, 152, 153) and unequal geographic distribution of, rehabilitation professionals (82, 140). Developed countries such as Australia, Canada, and the United States report shortages of rehabilitation personnel in rural and remote areas (154–156).

The low quality and productivity of the rehabilitation workforce in low-income countries are disconcerting. The training for rehabilitation and other health personnel in developing countries, can be more complex than in developed countries. Training needs to consider the absence of other practitioners for consultation and advice and the lack of medical services, surgical treatment, and follow-up care through primary health care facilities. Rehabilitation personnel working in low-resource settings require extensive knowledge on pathology, and good diagnostic, problem-solving, clinical decision-making, and communication skills (136).

Physiotherapy services are the ones most often available, often in small hospitals (144). A recent comprehensive survey of rehabilitation in Ghana identified no rehabilitation doctor or occupational therapist in the country, and only a few prosthetists, orthotists, and physical therapists, resulting in very limited access to therapy and assistive technologies (68). Services such as speech pathology are nearly absent in many countries (144). In India people with speech impairments were much less likely to receive assistive devices than people with visual impairments (112).

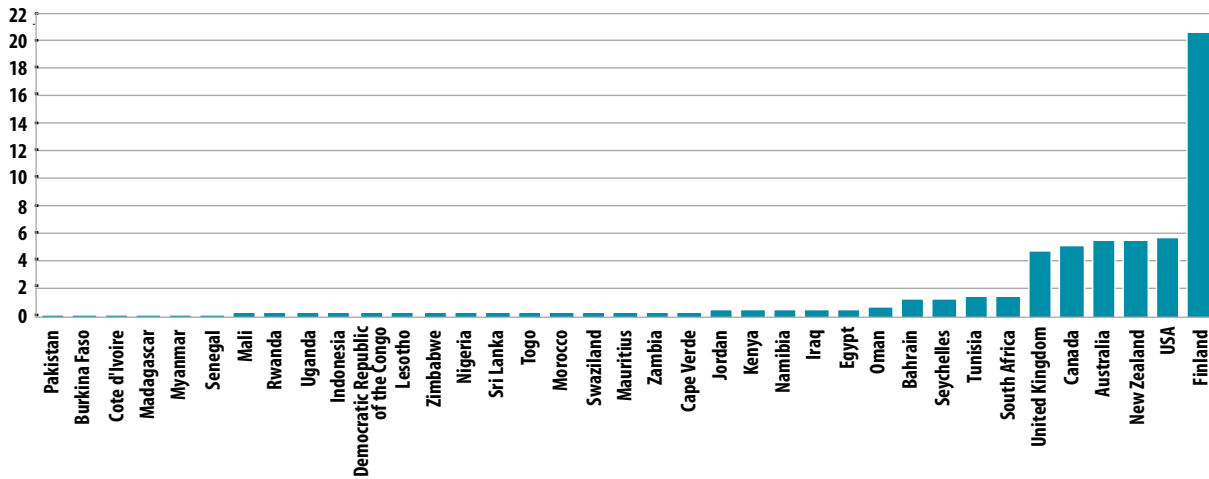
An extensive survey of rehabilitation doctors in sub-Saharan Africa identified only six, all in South Africa, for more than 780 million people, while Europe has more than 10 000 and the United States more than 7000 (142). Discrepancies are also large for other rehabilitation professions: 0.04–0.6 psychologists per 100 000 population in low-income and lower middle-income countries, compared with 1.8 in upper middle-income countries and 14 in high-income countries; and 0.04 social workers per 100 000 population in low-income countries compared with 15.7 in high-income countries (157). Data from official

statistical sources showing the large disparities in supply of physiotherapists are shown in Fig. 4.1, and data from a survey by the World Federation of Occupational Therapists showing the disparities in occupational therapists are shown in Fig. 4.2.

The lack of women in rehabilitation professions, and the cultural attitudes towards gender,

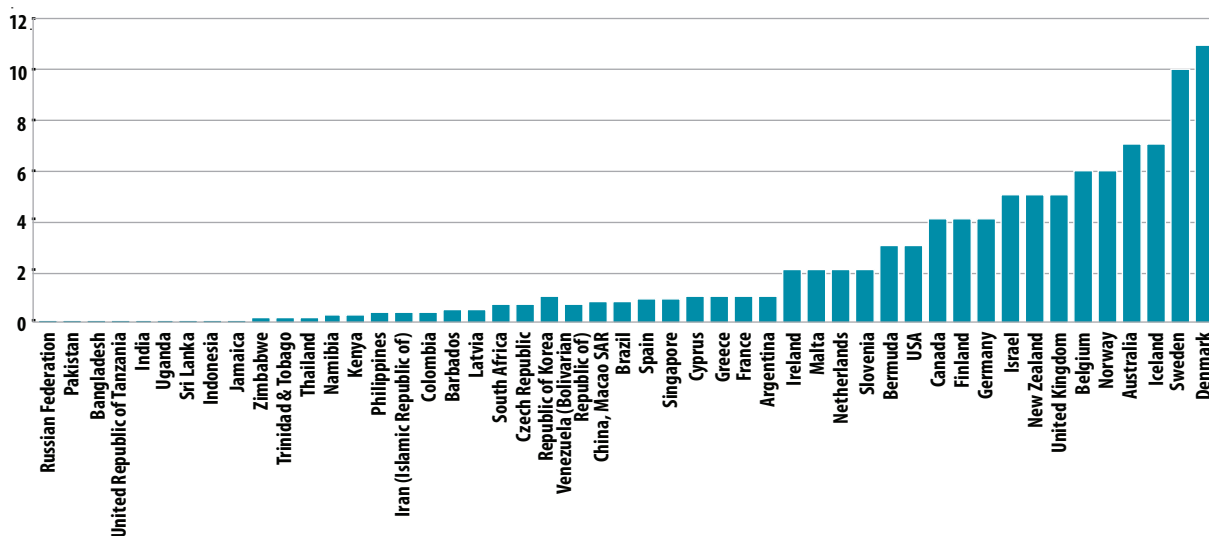
affect rehabilitation services in some contexts. The low number of women technicians in India, for example, may partly explain why women with disabilities were less likely than men to receive assistive devices (112). Female patients in Afghanistan can be treated only by female therapists, and men only by men. Restrictions on travel for women

Fig. 4.1. Physiotherapists per 10 000 population in selected countries



Source (158).

Fig. 4.2. Occupational therapists per 10 000 population in selected countries



Note: Many professional associations collect data on rehabilitation personnel. Professionals are not obliged, however, to be members or to respond to the survey questionnaires. This data was collated from 65 member organizations with a 93% response rate.

Source (159).

prevent female physiotherapists from participating in professional development and training workshops and limit their ability to make home visits (160).

Expanding education and training

Many developing countries do not have educational programmes for rehabilitation professionals. According to the 2005 global survey of 114 countries, 37 had not taken action to train rehabilitation personnel and 56 had not updated medical knowledge of health-care providers on disability (110).

Differences across countries in the type of training and the competency standards required influence the quality of services (92, 136, 161). University training for rehabilitation personnel may not be feasible in all developing countries because of the academic expertise required, the time and expense, and the ability of national governments and NGOs to sustain the training (162–165). Long-term funding commitment from Governments and donors is required (136, 166).

Education for rehabilitation personnel – commonly institutional and urban-based – is not always relevant to the needs of the population, especially in rural communities (167). In Afghanistan one study found that physical therapists with two years of training had difficulty with clinical reasoning and that clinical competencies varied, especially for managing complex disabilities and identifying their own training needs (168).

Given the global lack of rehabilitation professionals, mixed or graded levels of training may be required to increase the provision of essential rehabilitation services. Where graded training is used, consideration should be given to career development and continuing education opportunities between levels.

University professional education – advocated by developed countries and professional associations – builds discipline-specific qualifications in physical and occupational therapy,

prosthetics and orthotics, and speech and language, among others (162–165). Professional associations support minimum standards for training (162–164, 169). The complexity of working in resource-poor contexts suggests the importance of either university or strong technical diploma education (136). The feasibility of establishing and sustaining tertiary training needs is determined by several factors including political stability, availability of trained educators, availability of financial support, educational standards within the country, and the cost and time for training.

Low- and middle-income countries such as China, India, Lebanon, Myanmar, Thailand, Viet Nam, and Zimbabwe have responded to the lack of professional resources by establishing mid-level training programmes (92, 170). Rehabilitation training times have been shortened after wars and conflicts when the number of people with impairments has increased sharply – for example, in the United States after World War I, and in Cambodia after its civil war (126, 136, 171). Mid-level therapists are also relevant in developed countries: a collaborative project in north-eastern England compensated for difficulties in recruiting qualified professionals by training rehabilitation assistants to work alongside rehabilitation therapists (152).

Mid-level workers, therapists and technicians can be trained as multipurpose rehabilitation workers with basic training in a range of disciplines (occupational therapy, physical therapy, speech therapy, for example), or as profession-specific assistants that provide rehabilitation services under supervision (152, 170). Prosthetics and orthotics courses meet the WHO/ISPO standards in several developing countries including Afghanistan, Cambodia, Ethiopia, El Salvador, India, Indonesia, United Republic of Tanzania, Thailand, Togo, Sri Lanka, Pakistan, Sudan, and Viet Nam (see [Box 4.5](#)) (92, 172). A positive side-effect of mid-level training is that trained professionals are limited in their ability to emigrate to developed countries

Box 4.5. Education in prosthetics and orthotics through the University Don Bosco

In 1996 the University Don Bosco in San Salvador, El Salvador, started the first formal training programme for prosthetics and orthotics in Central America, with support from the German Technical Cooperation organization.

The University Don Bosco, now the leading institution for prosthetics and orthotics education in Latin America, has graduated about 230 prosthetists and orthotists from 20 countries. Programmes continued to expand even after external funding ended. The university now employs nine full-time prosthetics and orthotics teachers, and cooperates with the International Society for Prosthetics and Orthotics and other international organizations such as the World Health Organization (WHO), other universities, and private companies.

Several approaches were instrumental in the success of this training initiative:

- **Strong partnership.** An established education institution with strong pedagogical expertise, University Don Bosco was identified to assume overall responsibility for the training. The German Technical Cooperation agency, experienced in developing prosthetics and orthotics training programmes in Asia and Africa, provided the technical and financial support.
- **Long-term vision for sustainable training provision.** A six-month orientation phase enabled the different partners to agree on details of project implementation, including objectives, activities, indicators, responsibilities, and resources. A 7–10 year strategy enabled the programme to become self-sustaining.
- **Internationally recognized guidelines.** All University Don Bosco training programmes have been developed with support from the International Society for Prosthetics and Orthotics, accredited based on the international guidelines for training developed by the Society and by WHO.
- **Capacity building.** Technical content was developed and delivered by two advisors from the German Technical Cooperation for the initial three-year training programme (ISPO/WHO Category II). From the first intake of 25 students, two outstanding graduates were selected for postgraduate studies in Germany. Following their return in 2000, responsibilities were gradually transferred from the advisors to the graduates. In 2000 the programme expanded to accept up to 25 students from all over Latin America, and in 2002 additional support from WHO helped establish a distance-learning programme for prosthetist and orthotist personnel with a minimum of five years of experience. The distance-learning programme, available in Spanish, Portuguese, English, and French, is now also offered in Angola and Bosnia and Herzegovina. In 2006 a five-year degree programme in prosthetics and orthotics (ISPO /WHO Category I) was started.
- **Ensuring recruitment.** Prosthetic and orthotic technicians and engineers were integrated into the general health system in El Salvador, and support was provided to other countries to establish similar programmes.
- **Choosing appropriate technologies.** Identifying and developing appropriate technologies ensured sustainable provision.

(136). Mid-level training is also less expensive, and although insufficient by itself, it may be an option for extending services in the absence of full professional training (136).

Community-based workers – a third level of training – shows promise in addressing geographical access (173, 174). They can work across traditional health and social services boundaries to provide basic rehabilitation in the community while referring patients to more specialized services as needed (152, 175). CBR workers generally have minimal training, and rely on established medical and

rehabilitation services for specialist treatment and referral.

Providing opportunities for people with disabilities to train as rehabilitation personnel would broaden the pool of qualified people and could benefit patients through improved empathy, understanding, and communication (176).

Training existing health-care personnel in rehabilitation

The duration of specialist training for doctors in Physical and Rehabilitation Medicine varies

across the world: three years in China (Chinese Standards), at least four years in Europe (37), and five years in the United States (177). Some countries have used shorter courses to meet the urgent need for rehabilitation doctors: in China, for example, a one-year certificate course in applied rehabilitation, run between 1990 and 1997, was developed at Tongji Medical University, Wuhan, graduating 315 doctors now working across 30 provinces (Nan, personal communication 2010).

Primary health-care workers can benefit from broad rehabilitation training (using the biopsychosocial framework proposed by the ICF) (178). In the absence of rehabilitation specialists, health staff with appropriate training can help meet service shortages or supplement services. For example, nurses and health-care assistants can follow up on therapy services (179). Training programmes for health-care professionals should be user-driven, need-based, and relevant to the roles of the professionals (180).

Building training capacity

Academic institutions and universities in developed countries and international NGOs – with support from international donors and in partnership with governments or a local NGO – can build training capacity by helping train educators and supporting the upgrade of training courses in developing countries (136, 142, 181). The Cambodian School of Prosthetics and Orthotics, with La Trobe University in Australia, recently upgraded a programme from Category II (orthopaedic technologist) to a bachelor's degree in Prosthetics and Orthotics using distance education (182). This approach has enabled students to remain in their home country, and is more cost-effective than full-time study in Australia (182).

Where training capacity does not exist in one country, regional training centres may provide a transitional solution (see [Box 4.5](#)). Mobility India trains rehabilitation therapy assistants, and provides specific training in prosthetics and orthotics, to students from

India, Bangladesh, Nepal, and Sri Lanka. But this approach generates only a limited number of graduates, and travel and subsistence increase costs – so it cannot meet the vast personnel needs of other developing countries.

Curricula content

Training for rehabilitation personnel should include an overview of relevant national and international legislation, including the CRPD, that promotes client-centred approaches and shared decision-making between people with disabilities and professionals (167).

The ICF can create a common understanding among health-care staff, and facilitate communication, the use of assessment tools, and standardized outcome measures to better manage rehabilitation interventions (17, 178).

Tertiary and mid-level education can be made more relevant to the needs of people in rural communities by including content on community needs, using appropriate technologies, and using progressive education methods including active learning and problem-based orientation (167, 175, 183, 184). Including content on the social, political, cultural, and economic factors that affect the health and quality of life of persons with disabilities can make the curriculum more relevant to the context in which rehabilitation personnel will work (167, 185–187). Studies have also shown that interdisciplinary team training develops collaboration, reduces staff burnout, improves rehabilitation implementation, and increases client participation and satisfaction (188).

Recruiting and retaining rehabilitation personnel

Mechanisms to ensure employment for rehabilitation graduates are vital to the future of graduates and the sustainability of training. The WHO code of practice on the recruitment of health-care workers (189) reflects a commitment to strengthen health systems globally, and to address the unequal distribution

of health-care workers both within countries and throughout the world, particularly in sub-Saharan Africa and developing countries. The code stresses the need for awareness of local health care needs in low-income countries, and for promotion of worker exchanges and training between countries.

Several countries have training programmes that target potential rehabilitation and health students from the local community, especially in rural or remote areas (190). In Nepal the Institute of Medicine accepts local, mid-level health workers with a minimum of three years' experience for medical training. The rationale is that locally recruited and trained personnel may be better equipped and prepared for living in the local community (183). Thailand has used this strategy for rural recruitment and training, adapting it so that workers are assigned public sector positions in their home towns (190).

Even where training programmes exist, staff are often difficult to retain, particularly in rural and remote areas. Despite a huge need

for rehabilitation services in both urban and rural Cambodia, for example, hospitals cannot afford to hire rehabilitation professionals (136). Like other health staff, retaining rehabilitation professionals is affected by poor working conditions, safety concerns, poor management, conflict, inadequate training, and lack of career development and continuing education opportunities (68, 175, 190–192).

International demand for skills also influence where rehabilitation workers seek work (190, 193). Health-care workers often relocate from low-income countries to high-income countries, in search of better living standards, political stability, and professional opportunities (82, 144, 194, 195). While most attention has been given to medical and nursing professionals, a wave of physical therapists have also emigrated from developing countries such as Brazil, Egypt, India, Nigeria, and the Philippines (196, 197).

Long-term retention of personnel, using various incentives and mechanisms, is fundamental to continuing services (see [Table 4.2](#)).

Table 4.2. Incentives and mechanisms for retaining personnel

Mechanisms	Examples
Financial rewards	Financial bonuses for working in areas of need, or incentives such as subsidized housing, contributions to school fees, housing loans, and the provision of vehicles. In some countries governments subsidize training costs in return for a guaranteed period of service in rural or remote areas. Approaches should be evaluated and compared with the costs of alternative schemes such as the use of temporaries or overseas recruitment (190, 191, 194, 198).
Financial incentives for return to service	Expatriate rehabilitation professionals from developing countries can contribute significantly to the development of the rehabilitation infrastructure in their home countries. Providing financial incentives requires careful long-term evaluation (198).
Career development	Opportunities for promotion, recognition of skills and responsibilities, good supervision and support, practical training of resident medical and therapy workers (68, 181). Several countries are encouraging international undergraduate and graduate experience, with employers providing support – such as unpaid leave and subsidized travel costs.
Continuing education and professional development	Opportunities to attend in-service training, seminars and conferences, receive online and postgraduate training courses, and benefit from professional associations that promote quality in-service training (188, 195).
A good work environment	Improvements to building design, ensuring the safety and comfort of the workplace, and providing adequate equipment and resources for the work. Supportive and efficient management practices, including good management of workloads and the recognition of service (175, 190, 191, 194).

Expanding and decentralizing service delivery

Rehabilitation services are often located too far from where a person with a disability lives (199–201). Major rehabilitation centres are usually located in urban areas; even basic therapeutic services often are not available in rural areas (202, 203). Travelling to secondary or tertiary rehabilitation services can be costly and time-consuming, and public transport is often not adapted for people with mobility difficulties (77, 174). In Uganda two studies on clubfoot treatment protocols found a significant association between treatment adherence and the distance patients had to travel to the clinic (38, 204).

Some people with disabilities have complex rehabilitation needs requiring intensive or expert management in tertiary care settings (see [Box 4.6](#)) (77, 207, 208). However the majority of people require fairly low-cost, modest rehabilitation services in primary and secondary health care settings (119, 207). Integrating rehabilitation into primary and secondary health care settings can:

- Help coordinate the delivery of rehabilitation services (126), and having an interdisciplinary health care team under one roof can provide essential health care at an affordable cost (209).
- Improve availability, accessibility, and affordability (200) which can overcome barriers to referral, such as inaccessible locations, inadequate services, and the high costs of private rehabilitation (100, 126, 210).
- Improve patient experience by ensuring services are available early and that waiting time and travelling time are reduced. Together with patient involvement in service development, this can produce better outcomes, improve compliance with treatment, and increase satisfaction among patients and rehabilitation personnel (211).

Referral systems are required between different modes of service delivery (inpatient, outpatient, home-based care) and levels of health

service provision (primary, secondary, and tertiary care facilities and community settings) (100, 136, 212).

Integration and decentralization are therefore beneficial for people with conditions requiring regular or protracted interventions, and for elderly people (213). Evaluation of a primary care-based, low-vision service in Wales, showed that low-vision assessments increased by 51%; waiting time fell from more than six months to less than two months; travel time to the nearest provider was reduced for 80% of people; visual disability scores improved significantly; and 97% of patients said that they found the service helpful (214).

Coordinated multidisciplinary rehabilitation

Coordination is required to ensure the continuity of care when more than one provider is involved in rehabilitation (216). The aim of coordinated rehabilitation is to improve functional outcomes and reduce costs. Evidence has shown that the provision of coordinated, multidisciplinary rehabilitation services can be effective and efficient (208).

Multidisciplinary teams can convey many rehabilitation benefits to patients. For example, multidisciplinary rehabilitation for persons with disabilities associated with obstructive pulmonary disease has been found to reduce the use of health services (217). Multidisciplinary therapy services for elderly people showed that patients' ability to engage in activities of daily living improved, and the loss of functioning decreased (6, 218). Using a team approach to improve participation in society for young people with physical disabilities has proven cost-effective (219).

Community-delivered services

Community-delivered rehabilitation interventions are an important part of the continuum of rehabilitation services, and can help improve efficiency and effectiveness of inpatient rehabilitation services (220). A systematic review of the

Box 4.6. Brazil – Simplified rehabilitation programs in a hospital in São Paulo

São Paulo has seen a great increase in the number of people with injury-related disabilities. The Orthopaedic and Traumatology Institute at the Clinical Hospital of the Faculty of Medicine, University of São Paulo – a public referral hospital with 162 beds – receives the most severe cases of traumatic injury. Of the 1400 emergency patients admitted each month, about 50 have significant impairments that need extensive long-term rehabilitation services, including spinal cord injuries, hip fractures in the elderly, limb amputations, and patients with multiple injuries. In the 1980s and 1990s patients with injury-related disability could wait for a year or more before receiving placement at a rehabilitation centre. This delay increased the number of secondary complications – contractures, pressure sores, and infections – which reduced the effectiveness of rehabilitation services when they eventually became available.

In response, the Institute at the hospital created the Simplified Rehabilitation Program initially for people with spinal cord injuries, which was later extended to elderly persons with hip fractures and individuals with severe musculoskeletal injuries. The Program aims to prevent joint deformities and pressure sores, promote mobility and wheelchair transfers, manage bladder and bowel issues, control pain, improve self-care independence, and train caregivers (especially for quadriplegics and elderly patients).

The rehabilitation team also provides advice about assistive devices and home modifications. It comprises a physiatrist, physiotherapist, and rehabilitation nurse for the orientation work with patients and caregivers. In addition, a psychologist, social assistant, and occupational therapist may be involved for persons with multiple or complex impairments, such as those with quadriplegia. The team does not have its own specific unit in the hospital, but cares for patients on the general wards.

The Program is primarily educational and needs no special equipment. It usually starts in the second or third week after injury when the patient has become clinically stable, and continues for the two months that most patients remain in the hospital. Patients return for their first follow-up evaluation 30–60 days after discharge and periodically thereafter as needed. These visits focus on general medical care, prevention of complications, and basic rehabilitative care to maximize function. The Program has had a profound effect on the prevention of secondary complications (see table below).

Complications in patients with traumatic spinal cord injuries: comparative data between 1981–1991 and 1999–2008

Complications	1981–1991 (<i>n</i> = 186)	1999–2008 (<i>n</i> = 424)	Percentage point reduction
Urinary infection	85%	57%	28
Pressure sore	65%	42%	23
Pain ^a	86%	63%	23
Spasticity	30%	10%	20
Joint deformity	31%	8%	23

^a Pain is chronic pain that interfered with functional recovery.

Note: Patients in the two time periods were fairly comparable in terms of age (mean 29 years before, 35 years after) and gender (70% male before, 84% male after). Etiology differed between the before and after groups, with 54% of patients in the before group having sustained gunshot wounds, compared with only 19% after. Level of injury in the before group was 65% paraplegic and 35% quadriplegic, while the after group was 59% paraplegic and 41% quadriplegic.

Sources (205, 206).

This example suggests that developing countries with limited resources and large numbers of injuries can benefit from basic rehabilitation strategies, to reduce secondary conditions. This requires:

- acute care doctors recognizing patients with disabling injuries, and involving the rehabilitation team in their care as early as possible;
- a small and well trained team in the general hospital;
- basic rehabilitative care directed towards health promotion and prevention of complications, initiated soon after the acute phase of trauma care;
- provision of basic equipment and supplies.

Source (215).

Box 4.7. Physical assistance to earthquake victims and rehabilitation service strengthening in Gujarat, India

On 26 January 2001 an earthquake measuring 6.9 on the Richter scale struck Gujarat State, India. An estimated 18 000 people were killed and 130 000 people were injured in the Kutch District of Gujarat, creating a heavy burden on an already fragmented health care system. The response shows that overall care – particularly rehabilitation services for people with disabilities – can be considerably strengthened affordably and sustainably even in low-income and post-disaster settings.

In the wake of the disaster, a partnership between the state government of Gujarat, Handicap International (an international nongovernment organization) and the Blind People's Association (a local cross-disability NGO) was established to build the capacity of existing services.

Tertiary level

- The project improved equipment and infrastructure for physiotherapy and other aspects of facility-based rehabilitation at the Civil Paraplegic Hospital and in Kutch.
- It improved discharge planning for people with disabilities admitted to the Civil Paraplegic Hospital Centre through the training of social workers.
- Prior to the earthquake no referral system existed. Referral rates improved for people with disabilities from the Civil Hospital to a new community network of 39 disability and development organizations supporting community-based rehabilitation services.

District, secondary level

- The project improved rehabilitation service delivery by providing technical assistance to the Blind People's Association to establish one secondary-level rehabilitation centre – providing prosthetics and orthotics, and physical therapy (by eight visually impaired physiotherapists) near the new Kutch District Hospital. Nearly 3000 people received orthopaedic devices, an additional 598 received free assistive devices through the Government assistance scheme, and 208 people were fitted with devices in their homes by physical therapists. The referral centre supported satellite centres for six months after the earthquake.
- Coordination improved between different levels of government health providers, and between government health providers and nongovernmental organizations, with mechanisms for referral, treatment, and follow-up, which helped ensure access and continuity of service. An individual case record system and a directory of all rehabilitation facilities in and around Kutch were developed and managed by the primary health care centres.

Community level

- The project strengthened primary health care, training 275 health-care workers to identify people with disabilities and provide appropriate interventions and referral. An evaluation eight months after the training showed high knowledge retention, with many workers able to identify children with disabilities under 10 months old.
- It improved the provision of rehabilitation services at a community health centre through the establishment of a physiotherapy programme.
- It included the people with disabilities in development initiatives by training 24 community development workers, in 84 of 128 villages, to identify people with disabilities, deliver basic care and refer.
- It increased the proportion of persons with paraplegia having access to both hospital and community-based rehabilitation services.
- It increased awareness among community and family members, disabled persons, and professionals about disability prevention and disability management, through publishing eight new awareness materials in the local language.

Initial activities in 2001–2002 focused on people with spinal cord injury, and mortality within five years of being discharged from the hospital came down from 60% before the programme to 4% afterwards. As the project became successful, it expanded both geographically and to cover all types of disabilities. It now encompasses the entire state of Gujarat, where disability-related activities have been integrated into all levels of the government-run health care system.

Source Handicap International, internal reports.

effectiveness of community-based interventions to maintain physical function and independence in elderly people found that the interventions reduced the number of falls and admissions to nursing homes and hospitals, and improved physical function (6). Community-delivered services also respond to workforce shortages, geographical population dispersion, changing demographics, and technological innovations (175, 221). Efforts to provide rehabilitation more flexibly are increasing, including through home-based services and schools (222). Rehabilitation services should be provided as close as possible to people's homes and communities (223, 224).

In low-resource, capacity-constrained settings, efforts should focus on accelerating the supply of services in communities through CBR (112, 175), complemented with referral to secondary services (see **Box 4.7**) (175). Examples of measures in community-based rehabilitation include:

- Identifying people with impairments and facilitating referrals. CBR workers in Bangladesh were trained as “key informants” to identify and refer children with visual impairments to specialist eye camps; referrals by the informants accounted for 64% of all referrals to the eye camps. Children were identified earlier and were more representative of the overall incidence of blindness across the community (225). A subsequent review of 11 similar studies that used Participatory Rural Appraisal and informants to identify disabled children concluded that community-based methods were consistently less expensive than other methods, and that children benefited from longer engagement with subsequent community interventions (226).
- Delivering simple therapeutic strategies through rehabilitation workers, or taught to individuals with disabilities or a family member. Examples include adopting a better posture to prevent contractures, and training in daily living skills (227).
- Providing individual or group-based educational, psychological, and emotional support services for persons with disabilities and their families. A study of a CBR model for people with chronic schizophrenia in rural India found that while the community-based rehabilitation model was more time- and resource-intensive than outpatient services, it was more efficient, better at overcoming economic, cultural, and geographic barriers, better for programme compliance, and appropriate for resource-poor settings (211). Another study on CBR in Italy found that people with mental illness experienced improved interpersonal relationships and social inclusion. Very isolated people also benefited from the close relationship developed between the patient and the CBR worker (228).
- Involving the community. In Thailand a study in two rural districts building capacity for CBR used group meetings for people with disabilities, their families, and community members to manage rehabilitation problems collaboratively (167).

Increasing the use and affordability of technology

Assistive devices

Many people around the world acquire assistive technology on the open market. Access to assistive technology can be improved by improving economies of scale in purchasing and production to reduce cost. Centralized, large-scale collective purchasing, or consortium buying, nationally or regionally, can reduce costs. For example, the General Eye and Low Vision Centre in China, in the Hong Kong Special Administrative Region, has a centralized system that purchases bulk supplies of high-quality but affordable low-vision devices. The centre also undertakes quality control

and distributes low-vision devices to more than 70 non-commercial organizations in all regions (229).

Mass production can lower costs if the device uses universal design principles, and is marketed widely (see Chapter 6 for further details). Expanding markets beyond regional or national boundaries may generate the volume necessary to achieve economies of scale and to produce assistive devices at competitive prices (230, 231).

Manufacturing or assembling products locally, using local materials, can reduce cost and ensure that devices are suitable for the context. Locally-made products may be complex items such as wheelchairs, or simpler items such as seating. Other production options include importing the components and assembling the final product locally. Some governments offer low-interest loans to enterprises producing aids for people with disabilities, while others – Viet Nam, for example – offer tax exemptions and other subsidies to such manufacturers (232).

Reducing duty and import taxes can help where countries need to import assistive devices – for instance, because the local market is too small to sustain local production. Viet Nam does not impose import taxes on assistive devices for persons with disabilities (232), and Nepal has reduced duties for institutions importing assistive devices (233).

Even where free or subsidized schemes for provision of assistive devices are available, unless professionals and people with disabilities are aware of their existence, they will not benefit from them, so information sharing and awareness is vital (112, 234).

To ensure that assistive devices are appropriate, suitable and of high quality (89, 235–237), the devices need to:

- **Suit the environment.** A large number of wheelchairs in low-income and middle-income countries, donated by the international community without related services, are rejected because they are not appropriate for the user in their environment (238, 239).

- **Be suitable for the user.** Poor selection and fit of assistive devices, or lack of training in their use, may cause further problems and secondary conditions. Devices should be selected carefully and fitted properly. Users should be engaged in assessment and selection to minimize abandonment because of a mismatch between need and device.
- **Include adequate follow-up to ensure safe and efficient use.** A study in rural Finland on why prescribed hearing aids remain unused found that follow-up care, including counselling, resulted in increased and more consistent use of the devices. Availability and affordability of local maintenance is also important. Access to batteries affects ongoing hearing-aid use, for instance. Improved hearing-aid battery technologies are needed for resource-poor settings. A project in Botswana discovered that rechargeable batteries using solar power offered a promising option (240).

Telerehabilitation

The use of information, communication, and related technologies for rehabilitation is an emerging resource that can enhance the capacity and accessibility of rehabilitation measures by providing interventions remotely (241–243).

Telerehabilitation technologies include:

- video and teleconferencing technologies in accessible formats;
- mobile phones;
- remote data-collection equipment and telemonitoring – for example, cardiac monitors.

Technology may be used by people with disabilities, rehabilitation workers, peers, trainers, supervisors, and community workers and families.

Where the Internet is available, e-health (telehealth or telemedicine) and telerehabilitation techniques have enabled people in remote areas to receive expert treatment from

specialists located elsewhere. Examples of telerhabilitation include:

- telepsychiatry services (244), cardiac rehabilitation (245–247), speech and language therapy (248, 249), and cognitive rehabilitation for people with traumatic brain injury (250, 251);
- remote assessments to provide home modification services to underserved elderly people (252);
- training and support of health-care personnel (210);
- computerized guidelines to help clinicians use appropriate interventions (253);
- consultation between tertiary hospital and community hospitals for problems related to prosthetics, orthotics, and wheelchair prescription (254);
- sharing professional expertise between countries, as well as at critical times such as in the aftermath of a disaster (181).

Growing evidence on the efficacy and effectiveness of telerehabilitation shows that telerehabilitation leads to similar or better clinical outcomes when compared to conventional interventions (255). Further information on resource allocation and costs is needed to support policy and practice (255).

Expanding research and evidence-based practice

Some aspects of rehabilitation have benefited from significant research, but others have received little attention. Validated research on specific rehabilitation interventions and programmes for people with disabilities – including medical, therapeutic, assistive, and community-based rehabilitation – is limited (256–258). Rehabilitation lacks randomized controlled trials – widely recognized as the most rigorous method of testing interventions efficacy (259, 260).

Lack of reliable research hinders the development and implementation of effective rehabilitation policies and programmes. More research on rehabilitation in different contexts is needed, particularly on (261, 262):

- the link between rehabilitation needs, receipt of services, health outcomes (functioning and quality of life), and costs;
- access barriers and facilitators for rehabilitation, models of service provision, approaches to human resource development, financing modalities, among others;
- cost-effectiveness and sustainability of rehabilitation measures, including community-based rehabilitation programmes.

Obstacles to strengthening research capacity include insufficient rehabilitation researchers, inadequate infrastructure to train and mentor researchers, and the absence of partnerships between relevant disciplines and organizations representing persons with disabilities.

Research on rehabilitation has several characteristics that differ fundamentally from biomedical research, and which can make the research difficult:

1. There is no common taxonomy of rehabilitation measures (12, 257).
2. Rehabilitation outcomes can be difficult to characterize and study (257) given the breadth and complexity of measures. Rehabilitation often employs several measures simultaneously, and involves workers from different disciplines. This can often make it difficult to measure changes resulting from interventions, such as the specific outcomes from therapy compared to an assistive device where the two are used concurrently.
3. Few valid outcome measures for activity limitations and participation restrictions can be reliably scored by different health professionals within a multidisciplinary team (263, 264).
4. Sample sizes are often too small. The range of disabilities is extremely large, and conditions diverse. Rehabilitation measures are

highly individualized and based on health condition, impairments, and contextual factors, and often the numbers of people within homogeneous groups that can be included in research studies are small. This may preclude the use of controlled trials (37).

5. The need to allow for participation of people with disabilities – in decision-making through the process of rehabilitation – requires research designs and methods that may not be considered rigorous under current grading systems.
6. Research-controlled trials, which require blinding and placebo controls, may not be feasible or ethical if services are denied for control groups (260, 265).

Information and good practice guidelines

Information to guide good practice is essential for building capacity, strengthening rehabilitation systems, and producing cost-effective services and better outcomes.

Good rehabilitation practice uses research evidence. It is derived not from single studies, but from an interpretation of one or more studies, or systematic reviews of studies (265–267), and provides the best available research on techniques, effectiveness, cost–benefits, and consumer perspectives. Rehabilitation professionals can obtain information on good practices through:

- Guidelines that apply research knowledge, usually on a specific health condition, to actual practice for clinicians.
- An independent search for specific interventions.
- Continuing professional education.
- Clinical guidance notes on good practice from employers and health organizations.
- Discipline-specific Internet databases that appraise the research for clinicians. A wide variety of sources, including general bibliographic databases and databases specializing in rehabilitation research, are available on the Internet. Most of these databases

have already evaluated the research for quality, provided ratings of research studies, and summarized the evidence.

Evidence-based practice attempts to apply the most recent, appropriate, and effective rehabilitation interventions drawn from research (259). Barriers to the development of guidelines and to the integration of evidence into practice include: lack of professional time and skills, limited access to evidence (including language barriers), difficulty in arriving at a consensus, and adapting existing guidelines to local contexts. These issues are particularly relevant to developing countries (195, 268). A study from Botswana, for example, highlights the lack of policy implementation and use of research findings (269).

Where evidence is lacking, the expertise of clinicians and consumers could be used to develop consensus-based practice guidance. For instance, a “consensus conference” laid the foundation for WHO guidelines on the provision of manual wheelchairs in less-resourced settings. The guidelines were developed in partnership with the International Society for Prosthetics and Orthotics and the US Agency for International Development (270).

New Zealand’s pioneering *Autistic Spectrum Disorder Guidelines*, developed in response to gaps in service, provide a good example of the evidence-based approach. The guidelines cover identification and diagnosis of conditions, and discuss access to interventions and services (271). A wide range of stakeholders were involved in developing the guidelines, including people with autism, parents of children with autism, medical, educational, and community providers, and researchers from New Zealand and elsewhere, with particular attention to the perspectives and experiences of Māori and Pacific people. As a result of these guidelines, proven programmes have been scaled-up, increasing numbers of people trained in assessment and diagnosis of autism, and increasing numbers of people enquiring

about and receiving information on the condition. A range of programmes to help support families of people with disabilities have also been started (272). Guidelines developed for one setting may need adaptation for implementation in another setting.

Research, data, and information

Better data are needed on service provision, service outcomes, and the economic benefits of rehabilitation (273). Evidence for the effectiveness of interventions and programmes is extremely beneficial to:

- guide policy-makers in developing appropriate services
- allow rehabilitation workers to employ appropriate interventions
- support people with disabilities in decision-making.

Long-term longitudinal studies are needed to ascertain if expenditure for health and health-related services decreases if rehabilitation services are provided. Research is also needed on the effect rehabilitation has on families and communities, for example, the benefits accrued when caregivers return to paid work, when support services or ongoing long-term care costs are reduced, and when persons with disabilities and their families feel less isolated. A broad approach is required as benefits of rehabilitation often accrue to a different government budget line from that funding rehabilitation (207).

Relevant strategies for addressing barriers in research include the following:

- Involve end-users in planning and research, including people with disabilities and rehabilitation workers, to increase the probability that the research will be useful (269, 274).
- Use the ICF framework to help develop a global common language and assist with global comparisons (12, 17).
- Use a range of methodologies. More research such as that by the Cochrane

Collaboration (Rehabilitation and Related Therapies) (208) is needed when feasible. Alternative, rigorous research methodologies are indicated, including qualitative research, prospective observational cohort design (259), or high-quality, quasi-experimental designs that suit the research questions (265), including research studies on CBR (173).

- Systematically disseminate results so that policy across government reflects research findings, clinical practice can be evidence-based, and people with disabilities and their families can influence the use of research (269).
- Enhance the clinical and research environment. Providing international learning and research opportunities will often involve linking universities in developing countries with those in high-income and middle-income countries (68). Countries in a particular region, such as South-East Asia, can also collaborate on research projects (275).

Conclusion and recommendations

The priority is to ensure access to appropriate, timely, affordable, and high-quality rehabilitation interventions, consistent with the CRPD, for all those who need them.

In middle-income and high-income countries with established rehabilitation services, the focus should be on improving efficiency and effectiveness, by expanding the coverage and improving the relevance, quality, and affordability of services.

In lower-income countries the focus should be on introducing and gradually expanding rehabilitation services, prioritizing cost-effective approaches.

A broad range of stakeholders have roles to play:

- Governments should develop, implement, and monitor policies, regulatory

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mechanisms, and standards for rehabilitation services, as well as promoting equal access to those services.

- Service providers should provide the highest quality of rehabilitation services.
- Other stakeholders (users, professional organizations etc.) should increase awareness, participate in policy development, and monitor implementation.
- International cooperation can help share good and promising practices and provide technical assistance to countries that are introducing and expanding rehabilitation services.

Policies and regulatory mechanisms

- Assess existing policies, systems, services, and regulatory mechanisms, identifying gaps and priorities to improve provision.
- Develop or revise national rehabilitation plans, in accord with situation analysis, to maximize functioning within the population in a financially sustainable manner.
- Where policies exist, make the necessary changes to ensure consistency with the CRPD.
- Where policies do not exist, develop policies, legislation and regulatory mechanisms coherent with the country context and with the CRPD. Prioritize setting of minimum standards and monitoring.

Financing

Develop funding mechanisms to increase coverage and access to affordable rehabilitation services. Depending on each country's specific circumstances, these could include a mix of:

- Public funding targeted at persons with disabilities, with priority given to essential elements of rehabilitation including assistive devices and people with disability who cannot afford to pay.

- Promoting equitable access to rehabilitation through health insurance.
- Expanding social insurance coverage.
- Public-private partnership for service provision.
- Reallocation and redistribution of existing resources.
- Support through international cooperation including in humanitarian crises.

Human resources

Increase the numbers and capacity of human resources for rehabilitation. Relevant strategies include:

- Where specialist rehabilitation personnel are in short supply, develop standards in training for different types and levels of rehabilitation personnel that can enable career development and continuing education across levels.
- Establish strategies to build training capacity in accord with national rehabilitation plans.
- Identify incentives and mechanisms for retaining personnel especially in rural and remote areas.
- Train non-specialist health professionals (doctors, nurses, primary care workers) on disability and rehabilitation relevant to their roles and responsibilities.

Service delivery

Where there are none, or only limited, services introduce minimum services within existing health and social service provision. Relevant strategies include:

- Developing basic rehabilitation services within the existing health infrastructure.
- Strengthening rehabilitation service provision through community-based rehabilitation.

- Prioritizing early identification and intervention strategies using community workers and health personnel.

Where services exist, expand service coverage and improve service quality. Relevant strategies include:

- Developing models of service provision that encourage multidisciplinary and client-centred approaches.
- Ensuring availability of high quality services in the community.
- Improving efficiency by improved coordination between levels and across sectors.

In all settings, three principles are relevant:

- Include service-users in decision-making.
- Base interventions on sound research evidence.
- Monitor and evaluate outcomes.

Technology

Increase access to assistive technology that is appropriate, sustainable, affordable, and accessible. Relevant strategies include:

- Establishing service provision for assistive devices.

References

1. Stucki G, Cieza A, Melvin J. The International Classification of Functioning, Disability and Health (ICF): a unifying model for the conceptual description of the rehabilitation strategy. *Journal of Rehabilitation Medicine: official journal of the UEMS European Board of Physical and Rehabilitation Medicine*, 2007,39:279-285. doi:10.2340/16501977-0041 PMID:17468799
2. *Swedish disability policy: services and care for people with functional impairments: habilitation, rehabilitation, and technical aids* [Article No. 2006-114-24]. Stockholm, Socialstyrelsen, The National Board of Health and Welfare, 2006 (http://www.socialstyrelsen.se/Lists/Artikelkatalog/Attachments/9548/2006-114-24_200611424.pdf, accessed 11 May 2010).
3. Llewellyn G et al. Development and psychometric properties of the Family Life Interview. *Journal of Applied Research in Intellectual Disabilities*, 2010,23:52-62. doi:10.1111/j.1468-3148.2009.00545.x
4. *Learning disabilities and young children: identification and intervention* [Fact sheet]. New York, National Joint Committee on Learning Disabilities, 2006 (http://www.ldonline.org/article/Learning_Disabilities_and_Young_Children%3A_Identification_and_Intervention?theme=print, accessed 2 May 2010).
5. Storbeck C, Pittman P. Early intervention in South Africa: moving beyond hearing screening. *International Journal of Audiology*, 2008,47:Suppl 1S36-S43. doi:10.1080/14992020802294040 PMID:18781512
6. Beswick AD et al. Complex interventions to improve physical function and maintain independent living in elderly people: a systematic review and meta-analysis. *Lancet*, 2008,371:725-735. doi:10.1016/S0140-6736(08)60342-6 PMID:18313501
7. Velema JP, Ebenso B, Fuzikawa PL. Evidence for the effectiveness of rehabilitation-in-the-community programmes. *Leprosy Review*, 2008,79:65-82. PMID:18540238
8. Norris G et al. Addressing Aboriginal mental health issues on the Tiwi Islands. *Australasian Psychiatry: bulletin of Royal Australian and New Zealand College of Psychiatrists*, 2007,15:310-314. doi:10.1080/10398560701441687 PMID:17612884

- Training users and following up.
- Promoting local production.
- Reducing duty and import tax.
- Improving economies of scale based on established need.

To further enhance capacity, accessibility and coordination of rehabilitation measures the use of information and communication technologies - telerehabilitation - can be explored.

Research and evidence-based practice

- Increase research and data on needs, type and quality of services provided, and unmet need (disaggregated by sex, age, and associated health condition).
- Improve access to evidence-based guidelines on cost-effective rehabilitation measures.
- Disaggregate expenditure data on rehabilitation services from other health care services.
- Assess the service outcomes and economic benefits of rehabilitation.

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9. Mola E, De Bonis JA, Giancane R. Integrating patient empowerment as an essential characteristic of the discipline of general practice/family medicine. *The European Journal of General Practice*, 2008,14:89-94. doi:10.1080/13814780802423463 PMID:18821139
10. Steiner WA et al. Use of the ICF model as a clinical problem-solving tool in physical therapy and rehabilitation medicine. *Physical Therapy*, 2002,82:1098-1107. PMID:12405874
11. Bickenbach JE et al. Models of disablement, universalism and the international classification of impairments, disabilities and handicaps. *Social Science & Medicine (1982)*, 1999,48:1173-1187. doi:10.1016/S0277-9536(98)00441-9 PMID:10220018
12. Stucki G, Reinhardt JD, Grimby G. Organizing human functioning and rehabilitation research into distinct scientific fields. Part II: Conceptual descriptions and domains for research. *Journal of Rehabilitative Medicine: official journal of the UEMS European Board of Physical and Rehabilitation Medicine*, 2007,39:299-307. doi:10.2340/16501977-0051 PMID:17468802
13. Rimmer JH. Use of the ICF in identifying factors that impact participation in physical activity/rehabilitation among people with disabilities. *Disability and Rehabilitation*, 2006,28:1087-1095. doi:10.1080/09638280500493860 PMID:16950739
14. *World Health Organization International classification of functioning, disability, and health*. Geneva, World Health Organization, 2001.
15. Stucki G, Ustün TB, Melvin J. Applying the ICF for the acute hospital and early post-acute rehabilitation facilities. *Disability and Rehabilitation*, 2005,27:349-352. doi:10.1080/09638280400013941 PMID:16040535
16. Stucki G et al. Rationale and principles of early rehabilitation care after an acute injury or illness. *Disability and Rehabilitation*, 2005,27:353-359. doi:10.1080/09638280400014105 PMID:16040536
17. Rauch A, Cieza A, Stucki G. How to apply the International Classification of Functioning Disability and health (ICF) for rehabilitation management in clinical practice. *European Journal of Physical Rehabilitation Medicine*, 2008,44:439-442.
18. Forster A et al. Rehabilitation for older people in long-term care. *Cochrane Database of Systematic Reviews (Online)*, 2009,1CD004294- PMID:19160233
19. Khan F et al. Multidisciplinary rehabilitation for adults with multiple sclerosis. *Cochrane Database of Systematic Reviews (Online)*, 2007,2CD006036- PMID:17443610
20. Lacasse Y et al. Pulmonary rehabilitation for chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews (Online)*, 2006,4CD003793- PMID:17054186
21. Davies EJ et al. Exercise based rehabilitation for heart failure. *Cochrane Database of Systematic Reviews (Online)*, 2010,4CD003331- PMID:20393935
22. Iyengar KP et al. Targeted early rehabilitation at home after total hip and knee joint replacement: Does it work? *Disability and Rehabilitation*, 2007,29:495-502. doi:10.1080/09638280600841471 PMID:17364804
23. Choi JH et al. Multimodal early rehabilitation and predictors of outcome in survivors of severe traumatic brain injury. *The Journal of Trauma*, 2008,65:1028-1035. doi:10.1097/TA.0b013e31815eba9b PMID:19001970
24. Petruševičienė D, Krisciūnas A. Evaluation of activity and effectiveness of occupational therapy in stroke patients at the early stage of rehabilitation. [Kaunas] *Medicina (Kaunas, Lithuania)*, 2008,44:216-224. PMID:18413989
25. Scivoletto G, Morganti B, Molinari M. Early versus delayed inpatient spinal cord injury rehabilitation: an Italian study. *Archives of Physical Medicine and Rehabilitation*, 2005,86:512-516. doi:10.1016/j.apmr.2004.05.021 PMID:15759237
26. Nielsen PR et al. Costs and quality of life for prehabilitation and early rehabilitation after surgery of the lumbar spine. *BMC Health Services Research*, 2008,8:209- doi:10.1186/1472-6963-8-209 PMID:18842157
27. Global Early Intervention Network [website]. (<http://www.atsweb.neu.edu/cp/ei/>, accessed 11 May 2010).
28. Roberts G et al. Rates of early intervention services in very preterm children with developmental disabilities at age 2 years. *Journal of Paediatrics and Child Health*, 2008,44:276-280. doi:10.1111/j.1440-1754.2007.01251.x PMID:17999667
29. Clini EM et al. Effects of early inpatient rehabilitation after acute exacerbation of COPD. *Respiratory Medicine*, 2009,103:1526-1531. doi:10.1016/j.rmed.2009.04.011 PMID:19447015
30. Rahman A et al. Cluster randomized trial of a parent-based intervention to support early development of children in a low-income country. *Child: Care, Health and Development*, 2009,35:56-62. doi:10.1111/j.1365-2214.2008.00897.x PMID:18991970
31. Hadders-Algra M. General movements: a window for early identification of children at high risk for developmental disorders. *The Journal of Pediatrics*, 2004,145:Suppl12-18. doi:10.1016/j.jpeds.2004.05.017 PMID:15238899
32. Overview of Early Intervention. Washington, National Dissemination Center for Children with Disabilities, 2009 (<http://www.nichcy.org/babies/overview/Pages/default.aspx>, accessed 2 May 2010).
33. Finch E et al. *Physical rehabilitation outcome measures: a guide to enhanced clinical decision-making*, 2nd edition. Hamilton, Ontario, Canadian Physiotherapy Association, 2002.
34. Scherer MJ. Assessing the benefits of using assistive technologies and other supports for thinking, remembering and learning. *Disability and Rehabilitation*, 2005,27:731-739. doi:10.1080/09638280400014816 PMID:16096225
35. Scherer MJ et al. Predictors of assistive technology use: the importance of personal and psychosocial factors. *Disability and Rehabilitation*, 2005,27:1321-1331. doi:10.1080/09638280500164800 PMID:16298935

36. Turner-Stokes L et al. *Evidence-based guidelines for clinical management of traumatic brain injury: British national guidelines*. London, British Society of Rehabilitation Medicine Publications Unit, Royal College of Physicians, 2005.
37. Gutenbrunner C, Ward AB, Chamberlain MA. White book on Physical and Rehabilitation Medicine in Europe. *Journal of Rehabilitation Medicine: official journal of the UEMS European Board of Physical and Rehabilitation Medicine*, 2007,45:Suppl6-47. PMID:17206318
38. Pirani S et al. Towards effective Ponseti clubfoot care: the Uganda sustainable clubfoot care project. *Clinical Orthopaedics and Related Research*, 2009,467:1154-1163. doi:10.1007/s11999-009-0759-0 PMID:19308648
39. Tindall AJ et al. Results of manipulation of idiopathic clubfoot deformity in Malawi by orthopaedic clinical officers using the Ponseti method: a realistic alternative for the developing world? *Journal of Pediatric Orthopedics*, 2005,25:627-629. doi:10.1097/01.bpo.0000164876.97949.6b PMID:16199944
40. Wallen M, Gillies D. Intra-articular steroids and splints/rest for children with juvenile idiopathic arthritis and adults with rheumatoid arthritis. *Cochrane Database of Systematic Reviews (Online)*, 2006,1CD002824- PMID:16437446
41. Shah N, Lewis M. Shoulder adhesive capsulitis: systematic review of randomised trials using multiple corticosteroid injections. *The British Journal of General Practice: the journal of the Royal College of General Practitioners*, 2007,57:662-667. PMID:17688763
42. Bellamy N et al. Intraarticular corticosteroid for treatment of osteoarthritis of the knee. *Cochrane Database of Systematic Reviews (Online)*, 2006,2CD005328- PMID:16625636
43. Lambert RG et al. Steroid injection for osteoarthritis of the hip: a randomized, double-blind, placebo-controlled trial. *Arthritis and Rheumatism*, 2007,56:2278-2287. doi:10.1002/art.22739 PMID:17599747
44. Manheimer E et al. Meta-analysis: acupuncture for osteoarthritis of the knee. *Annals of Internal Medicine*, 2007,146:868-877. PMID:17577006
45. Tomassini V et al. Comparison of the effects of acetyl L-carnitine and amantadine for the treatment of fatigue in multiple sclerosis: results of a pilot, randomised, double-blind, crossover trial. *Journal of the Neurological Sciences*, 2004,218:103-108. doi:10.1016/j.jns.2003.11.005 PMID:14759641
46. Kranke P et al. Hyperbaric oxygen therapy for chronic wounds. *Cochrane Database of Systematic Reviews (Online)*, 2004,2CD004123- PMID:15106239
47. Quinn TJ et al. European Stroke Organisation (ESO) Executive Committee ESO Writing Committee Evidence-based stroke rehabilitation: an expanded guidance document from the European Stroke Organisation (ESO) guidelines for management of ischaemic stroke and transient ischaemic attack 2008. *Journal of Rehabilitation Medicine: official journal of the UEMS European Board of Physical and Rehabilitation Medicine*, 2009,41:99-111. doi:10.2340/16501977-0301 PMID:19225703
48. Heywood F. *Money well spent: the effectiveness and value of housing adaptations*. Bristol, The Policy Press, 2001.
49. Franssen M, McConnell S, Bell M. Exercise for osteoarthritis of the hip or knee. *Cochrane Database of Systematic Reviews (Online)*, 2003,3CD004286- PMID:12918008
50. Jolliffe J et al. Exercise-based rehabilitation for coronary heart disease. *Cochrane Database of Systematic Reviews (Online)*, 2009,1CD001800-
51. Rees K et al. Exercise based rehabilitation for heart failure. *Cochrane Database of Systematic Reviews (Online)*, 2004,3CD003331- PMID:15266480
52. Legg L et al. Occupational therapy for patients with problems in personal activities of daily living after stroke: systematic review of randomised trials. *BMJ (Clinical research ed.)*, 2007,335:922- doi:10.1136/bmj.39343.466863.55 PMID:17901469
53. McConachie H et al. Difficulties for mothers in using an early intervention service for children with cerebral palsy in Bangladesh. *Child: Care, Health and Development*, 2001,27:1-12. doi:10.1046/j.1365-2214.2001.00207.x PMID:11136337
54. Heiman JR. Psychologic treatments for female sexual dysfunction: are they effective and do we need them? *Archives of Sexual Behavior*, 2002,31:445-450. doi:10.1023/A:1019848310142 PMID:12238613
55. Alexander MS, Alexander CJ. Recommendations for discussing sexuality after spinal cord injury/dysfunction in children, adolescents, and adults. *The Journal of Spinal Cord Medicine*, 2007,30:Suppl 1S65-S70. PMID:17874689
56. Sipski ML et al. Effects of vibratory stimulation on sexual response in women with spinal cord injury. *Journal of Rehabilitation Research and Development*, 2005,42:609-616. doi:10.1682/JRRD.2005.01.0030 PMID:16586186
57. Waddell G, Burton AK, Kendall NAS. *Vocational rehabilitation: what works, for whom and when?* London, The Stationery Office, 2008.
58. *Employment assistance for people with mental illness. Literature review*. Commonwealth of Australia, 2008 (http://workplace.gov.au/NR/rdonlyres/39A1C4CE-0DE3-4049-A410-8B61D5509C#/0/MentalHealthEmploymentAssistanceLiteratureReview_web.doc, accessed 7 November 2008).
59. Assistive Technology Act. United States Congress 2004 (Public Law 108-364) (http://www.ataporg.org/atap/atact_law.pdf, accessed 12 December 2010)
60. Hunt PC et al. Demographic and socioeconomic factors associated with disparity in wheelchair customizability among people with traumatic spinal cord injury. *Archives of Physical Medicine and Rehabilitation*, 2004,85:1859-1864. doi:10.1016/j.apmr.2004.07.347 PMID:15520982

World report on disability

61. Evans JJ et al. Who makes good use of memory aids? Results of a survey of people with acquired brain injury. *Journal of the International Neuropsychological Society: JINS*, 2003,9:925-935. doi:10.1017/S1355617703960127 PMID:14632251
62. Olusanya BO. Classification of childhood hearing impairment: implications for rehabilitation in developing countries. *Disability and Rehabilitation*, 2004,26:1221-1228. doi:10.1080/09638280410001724852 PMID:15371023
63. Persson J et al. *Costs and effects of prescribing walkers*. Sweden, Center for Technology Assessment, 2007 (CMT rapport 2007:3).
64. Spillman BC. Changes in elderly disability rates and the implications for health care utilization and cost. *The Milbank Quarterly*, 2004,82:157-194. doi:10.1111/j.0887-378X.2004.00305.x PMID:15016247
65. Agree EM, Freedman VA. A comparison of assistive technology and personal care in alleviating disability and unmet need. *The Gerontologist*, 2003,43:335-344. PMID:12810897
66. Basavaraj V. Hearing aid provision in developing countries: an Indian case study. In: McPherson B, Brouillette R, eds. *Audiology in developing countries*. Boston, MA, Nova Science Publishers, 2008a.
67. Haig AJ. Developing world rehabilitation strategy II: flex the muscles, train the brain, and adapt to the impairment. *Disability and Rehabilitation*, 2007,29:977-979. doi:10.1080/09638280701480369 PMID:17577733
68. Tinney MJ et al. Medical rehabilitation in Ghana. *Disability and Rehabilitation*, 2007,29:921-927. doi:10.1080/09638280701240482 PMID:17577726
69. Buntin MB. Access to postacute rehabilitation. *Archives of Physical Medicine and Rehabilitation*, 2007,88:1488-1493. doi:10.1016/j.apmr.2007.07.023 PMID:17964894
70. Ottenbacher KJ, Graham JE. The state-of-the-science: access to postacute care rehabilitation services. A review. *Archives of Physical Medicine and Rehabilitation*, 2007,88:1513-1521. doi:10.1016/j.apmr.2007.06.761 PMID:17964898
71. Kephart G, Asada Y. Need-based resource allocation: different need indicators, different results? *BMC Health Services Research*, 2009,9:122- doi:10.1186/1472-6963-9-122 PMID:19622159
72. K Graham S, Cameron ID. A survey of rehabilitation services in Australia. *Australian Health Review: a publication of the Australian Hospital Association*, 2008,32:392-399. doi:10.1071/AH080392 PMID:18666866
73. Darrah J, Magil-Evans J, Adkins R. How well are we doing? Families of adolescents or young adults with cerebral palsy share their perceptions of service delivery. *Disability and Rehabilitation*, 2002,24:542-549. doi:10.1080/09638280210121359 PMID:12171644
74. Elrod CS, DeJong G. Determinants of utilization of physical rehabilitation services for persons with chronic and disabling conditions: an exploratory study. *Archives of Physical Medicine and Rehabilitation*, 2008,89:114-120. doi:10.1016/j.apmr.2007.08.122 PMID:18164340
75. Kroll T, Neri MT. Experiences with care co-ordination among people with cerebral palsy, multiple sclerosis, or spinal cord injury. *Disability and Rehabilitation*, 2003,25:1106-1114. doi:10.1080/0963828031000152002 PMID:12944150
76. Neri MT, Kroll T. Understanding the consequences of access barriers to health care: experiences of adults with disabilities. *Disability and Rehabilitation*, 2003,25:85-96. PMID:12554383
77. Dejong G et al. The organization and financing of health services for persons with disabilities. *The Milbank Quarterly*, 2002,80:261-301. doi:10.1111/1468-0009.t01-1-00004 PMID:12101873
78. Chi MJ et al. Social determinants of emergency utilization associated with patterns of care. *Health Policy (Amsterdam, Netherlands)*, 2009,93:137-142. PMID:19665250
79. Hatano T et al. Unmet needs of patients with Parkinson's disease: interview survey of patients and caregivers. *The Journal of International Medical Research*, 2009,37:717-726. PMID:19589255
80. Fulda KG et al. Unmet mental health care needs for children with special health care needs stratified by socioeconomic status. *Child and Adolescent Mental Health*, 2009,14:190-199. doi:10.1111/j.1475-3588.2008.00521.x
81. The Global Burden of Disease. *2004 Update*. Geneva, World Health Organization, 2008a. (http://www.who.int/healthinfo/global_burden_disease/2004_report_update/en/index.htm, accessed 2 May 2010).
82. Landry MD, Ricketts TC, Verrier MC. The precarious supply of physical therapists across Canada: exploring national trends in health human resources (1991 to 2005). *Human Resources for Health*, 2007,5:23-<http://www.human-resources-health.com/content/5/1/23> doi:10.1186/1478-4491-5-23 PMID:17894885
83. Bo W et al. The demand for rehabilitation therapists in Beijing health organizations over the next five years. *Disability and Rehabilitation*, 2008,30:375-380. doi:10.1080/09638280701336496 PMID:17852203
84. Lysack JT et al. Designing appropriate rehabilitation technology: a mobility device for women with ambulatory disabilities in India. *International Journal of Rehabilitation Research. Internationale Zeitschrift fur Rehabilitationsforschung. Revue Internationale de Recherches de Réadaptation*, 1999,22:1-9. PMID:10207746
85. Israsena P, Dubsok P, Pan-Ngum S. A study of low-cost, robust assistive listening system (ALS) based on digital wireless technology. *Disability and Rehabilitation. Assistive Technology*, 2008,3:295-301. doi:10.1080/17483100802323392 PMID:19117189
86. Lamoureux EL et al. The effectiveness of low-vision rehabilitation on participation in daily living and quality of life. *Investigative Ophthalmology & Visual Science*, 2007,48:1476-1482. doi:10.1167/iovs.06-0610 PMID:17389474

87. Durkin M. The epidemiology of developmental disabilities in low-income countries. *Mental Retardation and Developmental Disabilities Research Reviews*, 2002,8:206-211. doi:10.1002/mrdd.10039 PMID:12216065
88. *Deafness and hearing impairment*. Geneva, World Health Organization, 2010 (Fact sheet No. 300) (<http://www.who.int/mediacentre/factsheets/fs300/en/print.html>, accessed 7 June 2010)
89. McPherson B, Brouillette R. A fair hearing for all: providing appropriate amplification in developing countries. *Communication Disorders Quarterly*, 2004,25:219-223. doi:10.1177/15257401040250040601
90. *Guidelines for hearing aids and services for developing countries*. Geneva, World Health Organization, 2004.
91. Lindstrom A. Appropriate technologies for assistive devices in low-income countries. In: Hsu JD, Michael JW, Fisk JR, eds. *AAOS Atlas of orthoses and assistive devices*. Philadelphia, PA, Mosby/Esleiver, 2008.
92. World Health Organization, International Society for Prosthetics and Orthotics. *Guidelines for training personnel in developing countries for prosthetics and orthotics services*. Geneva, World Health Organization, 2005.
93. Atijosan O et al. The orthopaedic needs of children in Rwanda: results from a national survey and orthopaedic service implications. *Journal of Pediatric Orthopedics*, 2009,29:948-951. PMID:19934715
94. Loeb ME, Eide AH, eds. *Living conditions among people with activity limitations in Malawi: a national representative study*. Oslo, SINTEF, 2004.
95. Eide AH, Yusman K. *Living conditions among people with disabilities in Mozambique: a national representative study*. Oslo, SINTEF, 2009.
96. Eide AH et al. *Living conditions among people with activity limitations in Zimbabwe: a representative regional survey*. Oslo, SINTEF, 2003.
97. Eide AH, Loeb ME, eds. *Living conditions among people with activity limitations in Zambia: a national representative study*. Oslo, SINTEF, 2006.
98. Eide AH, van Rooy G, Loeb ME. *Living conditions among people with activity limitations in Namibia: a representative national survey*. Oslo, SINTEF, 2003.
99. Eide AH, Øderud T. Assistive technology in low income countries. In: Maclachlan M, Swartz L, eds. *Disability and international development*, Dordrecht, the Netherlands, Springer, 2009.
100. Eldar R et al. Rehabilitation medicine in countries of central/eastern Europe. *Disability and Rehabilitation*, 2008,30:134-141. doi:10.1080/09638280701191776 PMID:17852214
101. Zongjie Y, Hong D, Zhongxin X, Hui X. A research study into the requirements of disabled residents for rehabilitation services in Beijing. *Disability and Rehabilitation*, 2007,29:825-833. doi:10.1080/09638280600919657 PMID:17457741
102. Qiu ZY. *Rehabilitation need of people with disability in China: analysis and strategies* [in Chinese]. Beijing, Huaxia Press, 2007.
103. Carlson D, Ehrlich N. Assistive Technology and information technology use and need by persons with disabilities in the United States, 2001. Washington, DC, National Institute on Disability and Rehabilitation Research, U.S. Department of Education, 2005 (<http://www.ed.gov/rschstat/research/pubs/at-use/at-use-2001.pdf>, accessed 27 April 2007).
104. Chiang PPC. *The Global mapping of low vision services*. Melbourne, University of Melbourne, 2010.
105. Miller AR et al. Waiting for child developmental and rehabilitation services: an overview of issues and needs. *Developmental Medicine and Child Neurology*, 2008,50:815-821. doi:10.1111/j.1469-8749.2008.03113.x PMID:18811706
106. Passalent LA, Landry MD, Cott CA. Wait times for publicly funded outpatient and community physiotherapy and occupational therapy services: implications for the increasing number of persons with chronic conditions in Ontario, Canada. *Physiotherapy Canada. Physiothérapie Canada*, 2009,61:5-14. doi:10.3138/physio.61.1.5 PMID:20145747
107. El Sharkawy G, Newton C, Hartley S. Attitudes and practices of families and health care personnel toward children with epilepsy in Kilifi, Kenya. *Epilepsy & Behavior: E&B*, 2006,8:201-212. doi:10.1016/j.yebeh.2005.09.011 PMID:16275111
108. *Unmet need for disability services: effectiveness of funding and remaining shortfall*. Canberra, Australian Institute of Health and Welfare, 2002.
109. Cott C, Passalent LA, Borse E. Ontario community rehabilitation: a profile of demand and provision. Toronto, Arthritis Community Research & Evaluation Unit, 2007 (Working Paper 07-1-A) (<http://www.aceu.ca/pub/working-paper-07-01.html>, accessed 30 April 2010).
110. South-North Centre for Dialogue and Development. *Global survey of government actions on the implementation of the standard rules of the equalisation of opportunities for persons with disabilities*. Amman, Office of the UN Special Rapporteur on Disabilities, 2006:141.
111. Middleton JW et al. Issues and challenges for development of a sustainable service model for people with spinal cord injury living in rural regions. *Archives of Physical Medicine and Rehabilitation*, 2008,89:1941-1947. doi:10.1016/j.apmr.2008.04.011 PMID:18929022
112. *People with disabilities in India: from commitments to outcomes*. Washington, World Bank, 2009. (http://imagebank.worldbank.org/servlet/WDSContentServer/IW3P/IB/2009/09/02/000334955_20090902041543/Rendered/PDF/502090WP0Peopl1Box0342042B01PUBLIC1.pdf, accessed 8 December 2010).

World report on disability

113. *Birth defects: revision of draft resolution considered by the Executive Board at its 125th session reflecting comments and proposals made by Bahamas, Canada, Chile, Mauritius, New Zealand, Oman and Paraguay.* Geneva, World Health Organization, 2009 (EB 126/10 Add. 1) (http://apps.who.int/gb/ebwha/pdf_files/EB126/B126_10Add1-en.pdf, accessed 2 May 2010).
114. de Souza N et al. The determination of compliance with an early intervention programme for high-risk babies in India. *Child: Care, Health and Development*, 2006,32:63-72. doi:10.1111/j.1365-2214.2006.00576.x PMID:16398792
115. Cooper SA et al. Improving the health of people with intellectual disabilities: outcomes of a health screening programme after 1 year. *Journal of Intellectual Disability Research: JIDR*, 2006,50:667-677. doi:10.1111/j.1365-2788.2006.00824.x PMID:16901294
116. World Health Organization, Swedish Organizations of Disabled Persons International Aid Association. *Part 1. Community-Based Rehabilitation as we experienced it ... voices of persons with disabilities.* Geneva, World Health Organization, 2002.
117. Bigelow J et al. A picture of amputees and the prosthetic situation in Haiti. *Disability and Rehabilitation*, 2004,26:246-252. doi:10.1080/09638280310001644915 PMID:15164958
118. Lilja M et al. Disability policy in Sweden: policies concerning assistive technology and home modification services. *Journal of Disability Policies Studies*, 2003,14:130-135. doi:10.1177/10442073030140030101
119. *Disability and rehabilitation status review of disability issues and rehabilitation services in 29 African Countries.* Geneva, World Health Organization, 2004.
120. *Modernizing sickness and disability policy: OECD thematic review on sickness, disability and work issues paper and progress report.* Paris, Organisation for Economic Co-operation and Development, 2008.
121. Digiacomo M et al. Health information system linkage and coordination are critical for increasing access to secondary prevention in Aboriginal health: a qualitative study. *Quality in Primary Care*, 2010,18:17-26. PMID:20359409
122. Hilberink SR et al. Health issues in young adults with cerebral palsy: towards a life-span perspective. *Journal of Rehabilitation Medicine: official journal of the UEMS European Board of Physical and Rehabilitation Medicine*, 2007,39:605-611. doi:10.2340/16501977-0103 PMID:17896051
123. Holdsworth LK, Webster V, McFadyen A. Self-referral to physiotherapy: deprivation and geographical setting – is there a relationship? Results of a national trial. *Physiotherapy*, 2006,92:16-25. doi:10.1016/j.physio.2005.11.003
124. Holdsworth LK, Webster V, McFadyen A. What are the costs to NHS Scotland of self-referral to physiotherapy? Results of a national trial. *Physiotherapy*, 2007,93:3-11. doi:10.1016/j.physio.2006.05.005
125. Holdsworth LK, Webster V, McFadyen A. Physiotherapists' and general practitioners' views of self-referral and physiotherapy scope of practice: results from a national trial. *Physiotherapy*, 2008,94:236-243. doi:10.1016/j.physio.2008.01.006
126. Eldar R. Integrated institution–community rehabilitation in developed countries: a proposal. *Disability and Rehabilitation*, 2000,22:266-274. doi:10.1080/096382800296728 PMID:10864129
127. *Sickness, disability and work: keeping on track in the economic downturn.* Paris, Organisation for Economic Co-operation and Development, 2009 (Background paper).
128. *Convention on the Rights of Persons with Disabilities.* Geneva, United Nations, 2006 (<http://www2.ohchr.org/english/law/disabilities-convention.htm>, accessed 16 May 2009).
129. Palermo GB. The 1978 Italian mental health law—a personal evaluation: a review. *Journal of the Royal Society of Medicine*, 1991,84:99-102. PMID:1999825
130. Barbui C, Tansella M. Thirtieth birthday of the Italian psychiatric reform: research for identifying its active ingredients is urgently needed. *Journal of Epidemiology and Community Health*, 2008,62:1021-1021. doi:10.1136/jech.2008.077859 PMID:19008365
131. de Girolamo G et al. Compulsory admissions in Italy: results of a national survey. *International Journal of Mental Health*, 2008,37:46-60. doi:10.2753/IMH0020-7411370404
132. McColl MA, Boyce W. Disability advocacy organizations: a descriptive framework. *Disability and Rehabilitation*, 2003,25:380-392. doi:10.1080/0963828021000058521 PMID:12745947
133. Nunez G. Culture and disabilities. In: Drum CE, Krahn GL, Bersani H. *Disability and Public Health*, Washington, American Public Health Association, 2009:65–78.
134. *The Standard Rules on the Equalization of Opportunities for Persons with Disabilities.* New York, United Nations, 1993 (<http://www.un.org/esa/socdev/enable/dissre00.htm>, accessed 16 May 2009).
135. *Systems thinking for health systems strengthening.* Alliance for Health Policy and Systems Research. Geneva, World Health Organization, 2009b
136. Dunleavy K. Physical therapy education and provision in Cambodia: a framework for choice of systems for development projects. *Disability and Rehabilitation*, 2007,29:903-920. doi:10.1080/09638280701240433 PMID:17577725
137. *Annual Report 2009.* Phnom Penh, Disability Action Council, 2009. (http://www.dac.org.kh/cambodia_disability_resource_center/download/local-doc/DAC_Annual_Report_2009.pdf, accessed 12 July 2010).
138. Crowley JS, Elias R. *Medicaid's role for people with disabilities.* Washington, DC, Henry Kaiser Foundation, 2003.
139. Albrecht G, Seelman K, Bury M. *Handbook of Disability Studies.* London, Sage, 2003.
140. Sooful P, Van Dijk C, Avenant C. The maintenance and utilisation of government fitted hearing aids. *Central European Journal of Medicine*, 2009,4:110-118. doi:10.2478/s11536-009-0014-9

141. VeehofMMet al. What determines the possession of assistive devices among patients with rheumatic diseases? The influence of the country-related health care system. *Disability and Rehabilitation*, 2006,28:205-211. doi:10.1080/09638280500305064 PMID:16467055
142. Haig AJ et al. The practice of physical and rehabilitation medicine in sub-Saharan Africa and Antarctica: a white paper or a black mark? *Journal of Rehabilitation Medicine: official journal of the UEMS European Board of Physical and Rehabilitation Medicine*, 2009,41:401-405. doi:10.2340/16501977-0367 PMID:19479150
143. Woo J et al. In patient stroke rehabilitation efficiency: influence of organization of service delivery and staff numbers. *BMC Health Services Research*, 2008,8:86- doi:10.1186/1472-6963-8-86 PMID:18416858
144. Mock C et al., eds. *Strengthening care for the injured: Success stories and lessons learned from around the world*. Geneva, World Health Organization, 2010.
145. *Injuries, violence and disabilities biennial report 2008–2009*. Geneva, World Health Organization, 2010.
146. *Injuries, violence and disabilities biennial report 2006–2007*. Geneva, World Health Organization, 2008.
147. *Injuries, violence and disabilities biennial report 2004–2005*. Geneva, World Health Organization, 2006.
148. Massive need for rehabilitation and orthopedic equipment. Takoma Park, MD, Handicap International, 2010 (<http://www.reliefweb.int/rw/rwb.nsf/db900SID/VVOS-7ZVSU6?OpenDocument>, accessed 2 May 2010).
149. Goudge J et al. Affordability, availability and acceptability barriers to health care for the chronically ill: longitudinal case studies from South Africa. *BMC Health Services Research*, 2009,9:75- doi:10.1186/1472-6963-9-75 PMID:19426533
150. Brouillette R. The rehabilitation of hearing loss: challenges and opportunities in developing countries. In: McPherson B, Brouillette R, eds. *Audiology in developing countries*. Boston, MA, Nova Science Publishers, 2008b.
151. Dal Poz M et al., eds. *Handbook on monitoring and evaluation of human resources for health – with special applications for low- and middle-income countries*. Geneva, World Health Organization, 2009.
152. Stanmore E, Waterman H. Crossing professional and organizational boundaries: the implementation of generic rehabilitation assistants within three organizations in the northwest of England. *Disability and Rehabilitation*, 2007,29:751-759. doi:10.1080/09638280600902836 PMID:17453998
153. Al Mahdy H. Rehabilitation and community services in Iran. *Clinician in Management*, 2002,11:57-60.
154. Wilson RD, Lewis SA, Murray PK. Trends in the rehabilitation therapist workforce in underserved areas: 1980–2000. *The Journal of Rural Health: official journal of the American Rural Health Association and the National Rural Health Care Association*, 2009,25:26-32. doi:10.1111/j.1748-0361.2009.00195.x PMID:19166558
155. O'Toole K, Schoo AM. Retention policies for allied health professionals in rural areas: a survey of private practitioners. *Rural and Remote Health*, 2010,10:1331- PMID:20443649
156. MacDowell M et al. A national view of rural health workforce issues in the USA. *Rural and Remote Health*, 2010,10:1531- PMID:20658893
157. Saxena S et al. Resources for mental health: scarcity, inequity, and inefficiency. *Lancet*, 2007,370:878-889. doi:10.1016/S0140-6736(07)61239-2 PMID:17804062
158. *Global atlas of the health workforce*. Geneva, World Health Organization, 2008 (http://www.who.int/globalatlas/autologin/hrh_login.asp, accessed 1 June 2009).
159. *Occupational therapy human resources project 2010*. Melbourne, World Federation of Occupational Therapists, 2010.
160. Wickford J, Hultberg J, Rosberg S. Physiotherapy in Afghanistan—needs and challenges for development. *Disability and Rehabilitation*, 2008,30:305-313. doi:10.1080/09638280701257205 PMID:17852310
161. Higgs J, Refshauge K, Ellis E. Portrait of the physiotherapy profession. *Journal of Interprofessional Care*, 2001,15:79-89. doi:10.1080/13561820020022891 PMID:11705073
162. World Confederation for Physical Therapy [website]. (<http://www.wcpt.org/>, accessed 8 December 2010)
163. World Federation of Occupational Therapists [website]. (<http://www.wfot.org/schoollinks.asp>, accessed 8 December 2010).
164. International Association of Logopedics and Phoniatrics [website]. (<http://ialp.info/joomla/>, accessed 8 December 2010).
165. International Society for Prosthetics and Orthotics [website]. (<http://www.ispoint.org/>, accessed 8 December 2010).
166. Leavitt R. The development of rehabilitation services and suggestions for public policy in developing nations. *Pediatric Physical Therapy*, 1995,7:112-117. doi:10.1097/00001577-199500730-00005
167. Nualnetre N. Physical therapy roles in community based rehabilitation: a case study in rural areas of north eastern Thailand. *Asia Pacific Disability Rehabilitation Journal*, 2009,20:1-12.
168. Armstrong J, Ager A. Physiotherapy in Afghanistan: an analysis of current challenges. *Disability and Rehabilitation*, 2006,28:315-322. doi:10.1080/09638280500160337 PMID:16492626
169. Smyth J. Occupational therapy training in Uganda: the birth of a profession. *World Federation of Occupational Therapists Bulletin*, 1996,34:26-31.
170. *The education of mid-level rehabilitation workers: Recommendations from country experiences*. Geneva, World Health Organization, 1992.

World report on disability

171. Gwyer J. Personnel resources in physical therapy: an analysis of supply, career patterns, and methods to enhance availability. *Physical Therapy*, 1995,75:56-65, discussion 65-67. PMID:7809199
172. Annual progress report to WHO. Brussels, International Society for Prosthetics and Orthotics, 2010.
173. Hartley S et al. Community-based rehabilitation: opportunity and challenge. *Lancet*, 2009,374:1803-1804. doi:10.1016/S0140-6736(09)62036-5 PMID:19944850
174. Penny N et al. Community-based rehabilitation and orthopaedic surgery for children with motor impairment in an African context. *Disability and Rehabilitation*, 2007,29:839-843. doi:10.1080/09638280701240052 PMID:17577718
175. *Increasing access to health workers in remote and rural areas through improved retention: Global policy recommendations*. Geneva, World Health Organization, 2010.
176. Shakespeare T, Iezzoni LI, Groce NE. Disability and the training of health professionals. *Lancet*, 2009,374:1815-1816. doi:10.1016/S0140-6736(09)62050-X PMID:19957403
177. Certification Booklet of Information 2010-2011 Examinations. Rochester, MN, ABPMR (American Board of Physical Medicine and Rehabilitation), 2010.
178. Reed GM et al. Three model curricula for teaching clinicians to use the ICF. *Disability and Rehabilitation*, 2008,30:927-941. doi:10.1080/09638280701800301 PMID:18484388
179. Atwal A et al. Multidisciplinary perceptions of the role of nurses and healthcare assistants in rehabilitation of older adults in acute health care. *Journal of Clinical Nursing*, 2006,15:1418-1425. doi:10.1111/j.1365-2702.2005.01451.x PMID:17038103
180. Fronck P et al. The effectiveness of a sexuality training program for the interdisciplinary spinal cord injury rehabilitation team. *Sexuality and Disability*, 2005,23:51-63. doi:10.1007/s11195-005-4669-0
181. Lee AC, Norton E. Use of telerehabilitation to address sustainability of international service learning in Mexico: pilot case study and lessons learned. *HPA Resource*, 2009,9:1-5.
182. Kheng S. The challenges of upgrading from ISPO Category II level to Bachelor Degree level by distance education. *Prosthetics and Orthotics International*, 2008,32:299-312. doi:10.1080/03093640802109764 PMID:18720252
183. Matock N, Abeykoon P. Innovative programmes of medical education in south-east Asia. New Delhi, World Health Organization, 1993.
184. *Increasing the relevance of education for health professionals*. Geneva, World Health Organization, 1993.
185. Watson R, Swartz L. *Transformation through occupation*. London, Whurr, 2004.
186. Chipps JA, Simpson B, Brysiewicz P. The effectiveness of cultural-competence training for health professionals in community-based rehabilitation: a systematic review of literature. *Worldviews on Evidence-Based Nursing/Sigma Theta Tau International, Honor Society of Nursing*, 2008,5:85-94. doi:10.1111/j.1741-6787.2008.00117.x PMID:18559021
187. Niemeier JP, Burnett DM, Whitaker DA. Cultural competence in the multidisciplinary rehabilitation setting: are we falling short of meeting needs? *Archives of Physical Medicine and Rehabilitation*, 2003,84:1240-1245. doi:10.1016/S0003-9993(03)00295-8 PMID:12917868
188. Corrigan PW, McCracken SG. Training teams to deliver better psychiatric rehabilitation programs. *Psychiatric Services (Washington, DC)*, 1999,50:43-45. PMID:9890577
189. *International recruitment of health personnel: draft global code of practice* [EB126/8]. Geneva, World Health Organization, 2009c.
190. Lehmann U, Dieleman M, Martineau T. Staffing remote rural areas in middle- and low-income countries: a literature review of attraction and retention. *BMC Health Services Research*, 2008,8:19- doi:10.1186/1472-6963-8-19 PMID:18215313
191. Tran D et al. Identification of recruitment and retention strategies for rehabilitation professionals in Ontario, Canada: results from expert panels. *BMC Health Services Research*, 2008,8:249- doi:10.1186/1472-6963-8-249 PMID:19068134
192. Crouch RB. SHORT REPORT Education and research in Africa: Identifying and meeting the needs. *Occupational Therapy International*, 2001,8:139-144. doi:10.1002/oti.141 PMID:11823878
193. Global Health Workforce Alliance [web site]. (<http://www.ghwa.org/?74028ba8>, accessed 30 April 2010).
194. Willis-Shattuck M et al. Motivation and retention of health workers in developing countries: a systematic review. *BMC Health Services Research*, 2008,8:247- doi:10.1186/1472-6963-8-247 PMID:19055827
195. Magnusson L, Ramstrand N. Prosthetist/orthotist educational experience & professional development in Pakistan. *Disability and Rehabilitation. Assistive Technology*, 2009,4:385-392. doi:10.3109/17483100903024634 PMID:19817652
196. Oyeyemi A. Nigerian physical therapists' job satisfaction: a Nigeria - USA comparison. *Journal of African Migration*, 2002,1:1-19.
197. Asis M. *Health worker migration: the case of the Philippines*. XVII general meeting of the Pacific Economic Cooperation Council. Sydney, 1-2 May 2007.
198. Bärnighausen T, Bloom DE. Financial incentives for return of service in underserved areas: a systematic review. *BMC Health Services Research*, 2009,9:86- doi:10.1186/1472-6963-9-86 PMID:19480656
199. Shaw A. Rehabilitation services in Papua New Guinea. *Papua and New Guinea Medical Journal*, 2004,47:215-227. PMID:16862945

200. De Angelis C, Bunker S, Schoo A. Exploring the barriers and enablers to attendance at rural cardiac rehabilitation programs. *The Australian Journal of Rural Health*, 2008,16:137-142. doi:10.1111/j.1440-1584.2008.00963.x PMID:18471183
201. Monk J, Wee J. Factors shaping attitudes towards physical disability and availability of rehabilitative support systems for disabled persons in rural Kenya. *Asia Pacific Disability and Rehabilitation Journal*, 2008,19:93-113.
202. *The United Nations Standard Rules on the equalization of opportunities for persons with disabilities: government responses to the implementation of the rules on medical care, rehabilitation, support services and personnel training* [Part 1. Summary]. Geneva, World Health Organization, 2001:20.
203. Siqueira FC et al. [Architectonic barriers for elderly and physically disabled people: an epidemiological study of the physical structure of health service units in seven Brazilian states] *Ciência & Saúde Coletiva*, 2009,14:39-44. PMID:19142307
204. Herman K. Barriers experienced by parents/caregivers of children with clubfoot deformity attending specific clinics in Uganda. Cape Town, Department of Physiotherapy in the Faculty of Community and Health Science, University of the Western Cape, 2006.
205. Greve JMD, Chiovato J, Batistella LR. *Critical evaluation: 10 years SCI rehabilitation treatment in a developing country 1981–1991, Sao Paulo, Brazil*. Free paper in the 3rd Annual Scientific Meeting of the International Medical Society of Paraplegia. Kobe, Japan, 30 May–2 June 1994.
206. Souza DR et al. *Characteristics of traumatic spinal cord injuries in a referral center: Institute of Orthopaedics and Traumatology, Clinical Hospital, Faculty of Medicine, University of São Paulo, IOT-HCFMUSP, São Paulo, Brazil*. Free paper in the International Society of Physical and Rehabilitation Medicine World Congress. Istanbul, Turkey, 13–17 June 2009.
207. Turner-Stokes L. Politics, policy and payment—facilitators or barriers to person-centred rehabilitation? *Disability and Rehabilitation*, 2007,29:1575-1582. doi:10.1080/09638280701618851 PMID:17922328
208. Wade DT, de Jong BA. Recent advances in rehabilitation. *BMJ (Clinical research ed.)*, 2000,320:1385-1388. doi:10.1136/bmj.320.7246.1385 PMID:10818031
209. *Declaration of Alma-Ata: International Conference on Primary Health Care, Alma-Ata, USSR, 6–12 September 1978*. Geneva, World Health Organization, 1978 (http://www.who.int/publications/almaata_declaration_en.pdf, accessed 2 May 2010).
210. Wakerman J et al. Primary health care delivery models in rural and remote Australia: a systematic review. *BMC Health Services Research*, 2008,8:276- doi:10.1186/1472-6963-8-276 PMID:19114003
211. Chatterjee S et al. Evaluation of a community-based rehabilitation model for chronic schizophrenia in rural India. *The British Journal of Psychiatry: the journal of mental science*, 2003,182:57-62. doi:10.1192/bjp.182.1.57 PMID:12509319
212. *The World Health Report 2008: Primary health care, now more than ever*. Geneva, World Health Organization, 2008 (<http://www.who.int/whr/2008/en/index.html>, accessed 11 April 2010).
213. Tyrell J, Burn A. Evaluating primary care occupational therapy: results from a London primary health care centre. *British Journal of Therapy and Rehabilitation*, 1996,3:380-385.
214. Ryan B et al. The newly established primary care based Welsh Low Vision Service is effective and has improved access to low vision services in Wales. *Ophthalmic & Physiological Optics: the journal of the British College of Ophthalmic Opticians (Optometrists)*, 2010,30:358-364. doi:10.1111/j.1475-1313.2010.00729.x PMID:20492541
215. Mock C et al. Evaluation of trauma care capabilities in four countries using the WHO-IATSI Guidelines for Essential Trauma Care. *World Journal of Surgery*, 2006,30:946-956. doi:10.1007/s00268-005-0768-4 PMID:16736320
216. Boling PA. Care transitions and home health care. *Clinics in Geriatric Medicine*, 2009,25:135-148, viii. doi:10.1016/j.cger.2008.11.005 PMID:19217498
217. Griffiths TL et al. Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial. *Lancet*, 2000,355:362-368. doi:10.1016/S0140-6736(99)07042-7 PMID:10665556
218. Legg L, Langhorne P. Outpatient Service Trialists Rehabilitation therapy services for stroke patients living at home: systematic review of randomised trials. *Lancet*, 2004,363:352-356. doi:10.1016/S0140-6736(04)15434-2 PMID:15070563
219. Bent N et al. Team approach versus ad hoc health services for young people with physical disabilities: a retrospective cohort study. *Lancet*, 2002,360:1280-1286. doi:10.1016/S0140-6736(02)11316-X PMID:12414202
220. Turner-Stokes L, Paul S, Williams H. Efficiency of specialist rehabilitation in reducing dependency and costs of continuing care for adults with complex acquired brain injuries. *Journal of Neurology, Neurosurgery, and Psychiatry*, 2006,77:634-639. doi:10.1136/jnnp.2005.073411 PMID:16614023
221. Kendall E, Marshall C. Factors that prevent equitable access to rehabilitation for Aboriginal Australians with disabilities: the need for culturally safe rehabilitation. *Rehabilitation Psychology*, 2004,49:5-13. doi:10.1037/0090-5550.49.1.5
222. Ameratunga S et al. Rehabilitation of the injured child. *Bulletin of the World Health Organization*, 2009,87:327-328. doi:10.2471/BLT.09.057067 PMID:19551242
223. Watermeyer BS et al., eds. *Disability and social change: South Africa agenda*. Pretoria, Human Sciences Research Council, 2006.
224. Higgins L, Dey-Ghatak P, Davey G. Mental health nurses' experiences of schizophrenia rehabilitation in China and India: a preliminary study. *International Journal of Mental Health Nursing*, 2007,16:22-27. doi:10.1111/j.1447-0349.2006.00440.x PMID:17229271

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225. Muhit MA et al. The key informant method: a novel means of ascertaining blind children in Bangladesh. *The British Journal of Ophthalmology*, 2007,91:995-999. doi:10.1136/bjo.2006.108027 PMID:17431019
226. Gona JK et al. Identification of people with disabilities using participatory rural appraisal and key informants: a pragmatic approach with action potential promoting validity and low cost. *Disability and Rehabilitation*, 2010,32:79-85. doi:10.3109/09638280903023397 PMID:19925280
227. Hartley S, Okune J, eds. *CBR Policy development and implementation*. Norwich, University of East Anglia, 2008.
228. Barbato A et al. Outcome of community-based rehabilitation program for people with mental illness who are considered difficult to treat. *Journal of Rehabilitation Research and Development*, 2007,44:775-783. doi:10.1682/JRRD.2007.02.0041 PMID:18075936
229. General Eye and Low Vision Centre [web site]. (http://www.hksb.org.hk/en/index.php?option=com_content&view=article&id=39&Itemid=33, accessed 11 May 2010).
230. Bauer S, Lane J. Convergence of AT and mainstream products: keys to university participation in research, development and commercialization. *Technology and Disability*, 2006,18:67-78.
231. Lane J. Delivering the D in R&D: recommendations for increasing transfer outcomes from development projects. *Assistive Technology Outcomes and Benefits*, 2008,(Fall special issue).
232. The Law on Persons with Disabilities. Hanoi, Socialist Republic of Viet Nam, 2010 (51/2010/QH12).
233. Production and distribution of assistive devices for people with disabilities [Part 1 chapter 5 and part 2 chapter 9]. Bangkok, United Nations Economic and Social Commission for Asia and the Pacific, 1997.
234. Field MJ, Jette AM, eds. *The future of disability in America*. Washington, The National Academies Press, 2007.
235. Borg J, Lindström A, Larsson S. Assistive technology in developing countries: national and international responsibilities to implement the Convention on the Rights of Persons with Disabilities. *Lancet*, 2009,374:1863-1865. doi:10.1016/S0140-6736(09)61872-9 PMID:19944867
236. Borg J, Larsson S. The right to assistive technology and its implementation. In: Bhanushali K, ed. *UN convention on rights of persons with disabilities*. Ahmedabad, India, ICFAI University Press, forthcoming.
237. Vuorialho A, Karinen P, Sorri M. Counselling of hearing aid users is highly cost-effective. *European Archives of Oto-Rhino-Laryngology: official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS): affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery*, 2006,263:988-995. doi:10.1007/s00405-006-0104-0 PMID:16799805
238. Mukherjee G, Samanta A. Wheelchair charity: a useless benevolence in community-based rehabilitation. *Disability and Rehabilitation*, 2005,27:591-596. doi:10.1080/09638280400018387 PMID:16019868
239. Oderud T et al. User satisfaction survey: an assessment study on wheelchairs in Tanzania. In: Sheldon S, Jacobs NA, eds. *Report of a consensus conference on wheelchairs for developing countries, Bengaluru, India, 6-11 November 2006*. Copenhagen, International Society for Prosthetics and Orthotics, 2007:112-117.
240. Godisa [website]. (<http://www.godisa.org/>, accessed 17 December 2010).
241. Seelman KD, Hartman LM. Telerehabilitation: policy issues and research tools. *International Journal of Telerehabilitation*, 2009,1:47-58. doi:10.5195/ijt.2009.6013
242. Taylor DM et al. Exploring the feasibility of video conference delivery of a self management program to rural participants with stroke. *Telemedicine and e-Health*, 2009,15:646-654. doi:10.1089/tmj.2008.0165 PMID:19694589
243. Vainoras A et al. Cardiological telemonitoring in rehabilitation and sports medicine. *Studies in Health Technology and Informatics*, 2004,105:121-130. PMID:15718601
244. Rowe N et al. Ten-year experience of a private nonprofit telepsychiatry service. *Telemedicine and e-Health: the official journal of the American Telemedicine Association*, 2008,14:1078-1086. doi:10.1089/tmj.2008.0037 PMID:19119830
245. Körtke H et al. New East-Westfalian Postoperative Therapy Concept: a telemedicine guide for the study of ambulatory rehabilitation of patients after cardiac surgery. *Telemedicine Journal and e-health: the official journal of the American Telemedicine Association*, 2006,12:475-483. doi:10.1089/tmj.2006.12.475 PMID:16942420
246. Giallauria F et al. Efficacy of telecardiology in improving the results of cardiac rehabilitation after acute myocardial infarction. *Monaldi Archives for Chest Disease = Archivio Ronaldi per le malattie del torace / Fondazione clinica del lavoro, IRCCS [and] Istituto di clinica fisiologica e malattie apparato respiratorio, Università di Napoli, Secondo ateneo*, 2006,66:8-12. PMID:17125041
247. Ades PA et al. A controlled trial of cardiac rehabilitation in the home setting using electrocardiographic and voice transtelephonic monitoring. *American Heart Journal*, 2000,139:543-548. doi:10.1016/S0002-8703(00)90100-5 PMID:10689271
248. Sicotte C et al. Feasibility and outcome evaluation of a telemedicine application in speech-language pathology. *Journal of Telemedicine and Telecare*, 2003,9:253-258. doi:10.1258/135763303769211256 PMID:14599327
249. Theodoros DG. Telerehabilitation for service delivery in speech-language pathology. *Journal of Telemedicine and Telecare*, 2008,14:221-224. doi:10.1258/jtt.2007.007044 PMID:18632993
250. Tam SF et al. Evaluating the efficacy of tele-cognitive rehabilitation for functional performance in three case studies. *Occupational Therapy International*, 2003,10:20-38. doi:10.1002/oti.175 PMID:12830317
251. Man DW et al. A randomized clinical trial study on the effectiveness of a tele-analogy-based problem-solving programme for people with acquired brain injury (ABI). *NeuroRehabilitation*, 2006,21:205-217. PMID:17167189

252. Sanford JA, Butterfield T. Using remote assessment to provide home modification services to underserved elders. *The Gerontologist*, 2005,45:389-398. PMID:15933279
253. Damiani G et al. The effectiveness of computerized clinical guidelines in the process of care: a systematic review. *BMC Health Services Research*, 2010,10:2- doi:10.1186/1472-6963-10-2 PMID:20047686
254. Lemaire ED, Boudrias Y, Greene G. Low-bandwidth, Internet-based videoconferencing for physical rehabilitation consultations. *Journal of Telemedicine and Telecare*, 2001,7:82-89. doi:10.1258/1357633011936200 PMID:11331045
255. Kairy D et al. A systematic review of clinical outcomes, clinical process, healthcare utilization and costs associated with telerehabilitation. *Disability and Rehabilitation*, 2009,31:427-447. doi:10.1080/09638280802062553 PMID:18720118
256. Ebenbichler G et al. The future of physical & rehabilitation medicine as a medical specialty in the era of evidence-based medicine. *American Journal of Physical Medicine & Rehabilitation/Association of Academic Physiatrists*, 2008,87:1-3. doi:10.1097/PHM.0b013e31815e6a49 PMID:18158426
257. Dejong G et al. Toward a taxonomy of rehabilitation interventions: Using an inductive approach to examine the "black box" of rehabilitation. *Archives of Physical Medicine and Rehabilitation*, 2004,85:678-686. doi:10.1016/j.apmr.2003.06.033 PMID:15083447
258. Andrich R, Caracciolo A. Analysing the cost of individual assistive technology programmes. *Disability and Rehabilitation. Assistive Technology*, 2007,2:207-234. doi:10.1080/17483100701325035 PMID:19263539
259. Groah SL et al. Beyond the evidence-based practice paradigm to achieve best practice in rehabilitation medicine: a clinical review. *PM & R: the journal of injury, function, and rehabilitation*, 2009,1:941-950. PMID:19797005
260. Johnston MV et al. *The challenge of evidence in disability and rehabilitation research and practice: A position paper*. Austin, National Centre for the Dissemination of Disability Research, 2009.
261. Wee J. Creating a registry of needs for persons with disabilities in a Northern Canadian community: the disability registry project. *Asia Pacific Disability Rehabilitation Journal*, 2009,20:1-18.
262. Cornielje H, Velema JP, Finkenflügel H. Community based rehabilitation programmes: monitoring and evaluation in order to measure results. *Leprosy Review*, 2008,79:36-49. PMID:18540236
263. Greenhalgh J et al. "It's hard to tell": the challenges of scoring patients on standardised outcome measures by multidisciplinary teams: a case study of neurorehabilitation. *BMC Health Services Research*, 2008,8:217- doi:10.1186/1472-6963-8-217 PMID:18945357
264. Lamoureux EL et al. The Impact of Vision Impairment Questionnaire: an evaluation of its measurement properties using Rasch analysis. *Investigative Ophthalmology & Visual Science*, 2006,47:4732-4741. doi:10.1167/iovs.06-0220 PMID:17065481
265. Dijkers M. *When the best is the enemy of the good: the nature of research evidence used in systematic reviews and guidelines*. Austin, TX, National Center for the Dissemination of Disability Research, 2009.
266. Sudsawad P. *Knowledge translation: introduction to models, strategies, and measures*. Austin, TX, Southwest Educational Development Laboratory, National Center for the Dissemination of Disability Research, 2007 (<http://www.ncddr.org/kt/products/ktintro/>, accessed 2 May 2010).
267. Rogers J, Martin F. Knowledge translation in disability and rehabilitation research. *Journal of Disability Policy Studies*, 2009,20:110-126. doi:10.1177/1044207309332232
268. Turner TJ. Developing evidence-based clinical practice guidelines in hospitals in Australia, Indonesia, Malaysia, the Philippines and Thailand: values, requirements and barriers. *BMC Health Services Research*, 2009,9:235- doi:10.1186/1472-6963-9-235 PMID:20003536
269. Mmatli TO. Translating disability-related research into evidence-based advocacy: the role of people with disabilities. *Disability and Rehabilitation*, 2009,31:14-22. doi:10.1080/09638280802280387 PMID:18946807
270. World Health Organization, International Society for Prosthetics and Orthotics, United States Agency International Development. *Guidelines on the provision of manual wheelchairs in less-resourced settings*. Geneva, World Health Organization, 2008.
271. *New Zealand autism spectrum disorder guideline*. Wellington, New Zealand Ministries of Health and Education, 2008 (<http://www.moh.govt.nz/moh.nsf/indexmh/nz-asd-guideline-apr08>, accessed 15 March 2010).
272. *Disability support services*. Wellington, New Zealand Ministry of Health, 2009 ([http://www.moh.govt.nz/moh.nsf/pagesmh/8594/\\$File/asd-newsletter-mar09.pdf](http://www.moh.govt.nz/moh.nsf/pagesmh/8594/$File/asd-newsletter-mar09.pdf), accessed 16 May 2009).
273. Tomlinson M et al. Research priorities for health of people with disabilities: an expert opinion exercise. *Lancet*, 2009,374:1857-1862. doi:10.1016/S0140-6736(09)61910-3 PMID:19944866
274. Stewart R, Bhagwanjee A. Promoting group empowerment and self-reliance through participatory research: a case study of people with physical disability. *Disability and Rehabilitation*, 1999,21:338-345. doi:10.1080/096382899297585 PMID:10471164
275. Chino N et al. Current status of rehabilitation medicine in Asia: a report from new millennium Asian symposium on rehabilitation medicine. *Journal of Rehabilitation Medicine: official journal of the UEMS European Board of Physical and Rehabilitation Medicine*, 2002,34:1-4. doi:10.1080/165019702317242631 PMID:11900256