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Meeting AT needs in humanitarian crises: The current state of provision

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ABSTRACT

Humanitarian coordination systems increasingly recognize and aim to respond to the needs of people with disabilities within populations affected by crises, spurred on by the UN Convention on the Rights of Persons with Disabilities (CRPD) which was adopted in 2006. Many agencies state their aim to meet the requirements of the CRPD using a “twin track” approach: ensuring the inclusion of people with disabilities in mainstream provision, alongside targeted support for their needs, which may include the need for Assistive Technology (AT). However, there is very little evidence of AT provision in humanitarian settings, which is a specific and urgent need for many people including the elderly and people with disabilities, and an implicit requirement of Article 11 of the CRPD and World Health Assembly resolution on improving access to assistive technology. There is also little evidence of effective mechanisms for AT provision in humanitarian settings. This is despite high and growing levels of unmet AT need in crises, and despite the legally binding requirement in the CRPD to provide AT for those who need it. AT provision faces unique challenges in humanitarian settings. This paper discusses the evidence available in the literature for the scale and quality of AT provision interventions in crises, and what is known about the challenges and facilitators of provision. We conducted a search of the academic literature and retained literature that reported on any form of AT provision following crisis, where international humanitarian response was in place, published in English between January 2010 and June 2020. We found very few examples in that academic literature of systematic and coordinated AT provision at the acute stage of crisis, and even less in the preparedness and post-acute stages. However, it is difficult to assess whether this is the result of insufficient academic attention or reflects a lack of provision. The small body of academic literature that describes AT provision in humanitarian settings paints a picture of small-scale provision, specialized to single types of impairments, and delivered by predominantly by NGOs. We also conducted a search of the gray literature, using the same inclusion criteria, in two countries: Afghanistan and South Sudan (case studies forthcoming). This gray literature provided supplementary evidence of the types of AT providers and AT provision available in those protracted crises. There are very few examples of how AT services can be scaled up (from a very low baseline) and maintained sustainably within a strengthened health system. The literature also describes more examples of provision of assistive products for mobility over assistive products for other impairments. If the paucity of literature on AT provision in humanitarian settings is a reflection of the scale of provision, this implies a deficiency in humanitarian response when it comes to providing people with AT needs with the essential products and services to which they have a right, and which will enable their access to basic, life-saving assistance. We conclude by providing recommendations for urgent actions that the AT and humanitarian community must take to fill this critical gap in the provision of essential products and services for a potentially marginalized and excluded group.

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emergencies and natural disasters; policy and legislation; service delivery

Introduction

The UN Convention on the Rights of People with Disabilities (CRPD) represents a milestone in terms of defining the responsibilities of governments and other humanitarian actors in emergency response. Article 11 of the CRPD states that State Parties ‘should take [...] all necessary measures to ensure the protection and safety of persons with disabilities in situations of risk, including situations of armed conflict, humanitarian emergencies and the occurrence of natural disasters’ (United Nations, 2006). Assistive technology (AT) encompasses the systems, services and products that maintain or improve an individual’s functioning and independence, thereby promoting their well-being (WHO, 2013). There is an urgent and growing gap in AT access for people with functional limitations in humanitarian

settings. Both the number of crises and the number of people affected by crises is increasing (World Confederation for Physical Therapy, 2016) and more so in low- and middle-income countries (LMICs), where estimates indicate AT access is already limited and meets as little as 5–15% of the population that needs it (United Nations Development Programme, 2014). Though there is a dearth of prevalence data, LMICs are more likely to have higher rates of disability across all demographic groups (World Health Organization, 2011), even before crisis hits. As we will note, humanitarian contexts offer a particular set of challenges, including related to access, security, coordination and equity, which make setting up a functioning AT ecosystems especially challenging compared with other contexts, including LMICs.

As mortality rates in crises have decreased, the rate of survivors with disabilities has increased (Reinhardt et al., 2011; Sheppard & Landry, 2016). The CRPD defines disability as “long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder [a person’s] full and effective participation in society on an equal basis with others” (United Nations, 2006).

Survivors may acquire a disability through injuries sustained as a direct result of a crisis or indirectly through long-term negative impacts on infrastructure, food security (Devakumar et al., 2014), poverty, health (Khan, Amatya, Gosney, Rathore, Burkle et al., 2015a; Reinhardt et al., 2011) and displacement (Danquah et al., 2015). In addition to the growing disability rate, aging populations and higher prevalence of non-communicable diseases worldwide mean that we can expect AT needs in crisis settings to continue to grow. Humanitarian crises worsen the challenges in the environment. People might lose or damage their assistive products or live in inaccessible informal settlements as a result of displacement. In these circumstances, even those with preexisting impairments that were not previously disabling may find that they are unable to function as before (WHO, 2011).

In summary, humanitarian contexts may have higher prevalence of disability due to poverty and other underlying causes. Preexisting limitations are exacerbated by conflict and disaster that present new barriers to access and provision, and humanitarian contexts also present a caseload of newly impaired persons and those whose devices become lost or damaged in the aftermath.

The CRPD makes clear that State parties must ensure that AT is equitably provided to all who require it (Borg et al., 2011). In humanitarian crises, the accountable agencies for the humanitarian response – including national government and UN agencies – must work together to comply with the requirements of the CRPD. In doing so, they must consider three groups of people with AT needs (Tataryn & Blanchet, 2012): (i) people who newly acquire a disability as a result of the immediate or long-term effects of the crisis, who in some cases may represent only a minority of people with AT needs; (ii) people who have lost or damaged their assistive product in the crisis, again, likely to be a relatively small number given the paucity of product availability in most pre-crisis settings; and (iii) those who have unidentified AT needs that have not yet been met, even before the crisis (Tataryn & Blanchet, 2012). This third group is likely to be the biggest.

Humanitarian crises place pressures on preexisting systems for healthcare provision and, therefore, are also likely to constrain any preexisting systems for AT provision (Bar-On et al., 2011; Nagai et al., 2007). Challenges include the growing population with AT needs, which may include newly displaced people relying on humanitarian support. This might coincide with an exodus of local professionals and experts with a role in healthcare and rehabilitation because of the deteriorating humanitarian situation. AT distribution systems face many practical obstacles in humanitarian contexts – including

security restrictions and the prevention of access to areas controlled by different political groups. As with other types of service provision, AT provision may also be constrained by political issues, for example, government policies on eligibility to receive health care and AT services in a national system, which may preclude refugees and displaced people, or restrictions on imports such as batteries for hearing aids.

While humanitarian actors must recognize the provision of AT as a priority, there are several challenges in doing so. These include, how to identify AT needs in humanitarian contexts and how to coordinate covering those needs at scale in a timely manner and in environments with little or no existing architecture of AT provision. This is compounded by challenges in procurement, distribution and resourcing. This paper examines those challenges and explores barriers and facilitators to meeting them.

Methodology

This thematic review is intended to provide an overview of available academic knowledge on AT provision in humanitarian settings. A literature review was undertaken using key terms for the search, drawing on literature related to the development of search strategies related to people with disability (e.g., H. K. Brown et al., 2020; Ioerger et al., 2019; Walsh et al., 2014). This elicited the following key terms¹ “disab*” and “humanitarian respons*”; (“humanitarian cris*; humanitarian intervention*”; “humanitarian action*”) “unicef*”; “child*”; “adolescent*” “un agency”; “disaster*”; “conflict*,” “crisis*”; “impair*”; “injury”; “assistive technolog*” (“assistive devices*”; “assistive products”) “occupational therap*”; “physiotherapy*”; “prosthe*”; “ortho*”; “market shaping*”; “disaster medic*”; “emergency medic*”; “rehabilitat*.” We employed AND, OR operators with variations of those terms. Only articles that were (a) written in English; (b) written between January 2010 and the date of the search (June 30, 2020) were included to ensure that we captured the most up-to-date knowledge on best practice. Disability inclusion and AT provision in humanitarian settings are relatively nascent areas of research and practice, and so articles over ten years old are considered unlikely to yield relevant evidence for current practice.

We conducted electronic searches in the following databases: *Cochrane Library*; *ERIC (ProQuest)*; *Global; Index Medicus*; *Google Scholar*; *Health and Psychosocial Instruments (HAPI)*; *MEDLINE (Ovid)*; *Middle East and Africa database (ProQuest)*; *Political Science database (ProQuest)*; *Public Health Database (ProQuest)*; *PubMed*; *Social Policy and Practice*. Those databases were chosen because they are widely used in health care research and international development research. To identify articles that may have been missed in our database searches, we hand-searched the reference lists of the key systematic and scoping reviews related to the field of assistive technology in low-resource settings and added additional articles that fit the criteria. This elicited 702 articles. These documents were downloaded into Mendeley reference manager. After removing duplicates, 593 articles remained.

¹The evidence for this paper is extracted from a search conducted for a forthcoming review of the literature on access and provision of assistive technology for children in humanitarian settings. Our literature search was not limited to the theme of assistive technology for children, (in order to capture all as many examples of AT provision as possible, on the understanding that there is likely to be little specialist provision for children). Therefore, we used the results of that literature search as a basis for this overview.:

Two reviewers independently chose which articles should be excluded based on agreed criteria; the reviewers discussed any cases on which they disagreed and used a third reviewer as a judge to resolve any disagreements. We excluded literature on HICs based on the World Bank country classifications. Given the paucity of the literature, included all articles irrespective of study design. We included published commentaries, opinion pieces, first-hand accounts and conference proceedings if they were published in reputable journals found using the databases searched. We also excluded items which were inaccessible at the time of the review (e.g., book sections, which during the 2020 pandemic could not be accessed).

We used the over 70 articles resulting from our search to gain an understanding of the humanitarian context, landscape of guidance related to AT provision and barriers and facilitators of AT provision. The vast majority of the articles that we found only mention AT in passing, or very briefly in the wider contexts of physical rehabilitation or surgical services. To be included in our section on examples of AT provision in humanitarian settings, we employed an additional inclusion criterion: articles had to provide a description of rehabilitation services inclusive of some form of assistive product or service provision for people with disabilities following crisis, where international humanitarian response was in place at the time of the intervention. We excluded all literature that focused exclusively on immediate surgical response and emergency medical treatment *without* any reference to AT provision or rehabilitation. We also excluded articles which did not describe AT-provision interventions (e.g., prevalence studies, needs analyses). Only 15 articles remaining met the inclusion criteria for this second category.

A separate review was conducted of the gray literature on assistive technology provision and access in two case countries: South Sudan and Afghanistan. We searched the websites of over 35 agencies known to have a role in the provision of humanitarian services in those case countries, based on the reviewer's field-based knowledge, and using snowballing methods once we identified relevant literature on these focus countries. We used search terms based on those in our academic literature review, tailored to the search functions of each website. We included only articles published in English, between January 2010 and September 2020. This elicited 284 documents, of which 153 pertained to Afghanistan, 131 to South Sudan. The majority of these referred to disability programmes that focussed on accessibility of services to people with disabilities (i.e., not AT provision). We detail the few examples of AT provision which we found.

What is known about best practice?

There is a large body of literature and consensus (MacLachlan & Scherer, 2018) on what effective AT provision must consider. According to WHO and other sources (MacLachlan & Scherer, 2018; World Health Organisation, 2021), an effective AT ecosystem should

- be user-centered, recognizing that no one AT user is exactly like another; and assistive products must be adapted to be appropriate to the user's needs and context.
- be supported by an enabling policy environment which is based on a recognition of the rights of people with

disabilities, and which tackles contextual barriers to provision.

- source appropriate, high quality and affordable products that meet the needs of the population and are appropriate for the context where they will be used;
- Be based on effective procurement systems to ensure the supply of reliable, high-quality and affordable AT.
- promote the identification, training and deployment of skilled and competent health personnel.
- be integrated across all levels of the health system (from community, primary to tertiary health-care level); facilitate the delivery of cost-effective, accessible, timely, user-centered AT services and use of referral pathways.
- Ensure regular data collection (e.g., through national census) to capture the needs, demand, and barriers to access assistive products, as well as AT users' satisfaction with their assistive products and services.

There is no evidence on what the most effective model of AT provision in a humanitarian crisis is, which is likely to be highly context dependent. However, humanitarian response must recognize all those components above whilst adapting to the particular challenges raised by widely varying humanitarian situations.

There is also an overall lack of systematic evaluations of "what works" for disability inclusion in humanitarian settings in general (Gap Analysis (Elrha, 2020); Improving social inclusion and empowerment for people with disabilities in low, 2018); therefore, it is perhaps unsurprising that there is little evidence on best models of AT provision in crisis. The few reviews available tend to focus on the provision of physiotherapy (and some limited occupational therapy) and, though usually favorable, they often highlight the ad hoc nature of services and the lack of a comprehensive service model (Mousavi, Ardalan et al., 2019; Mousavi, Khorasani-Zavareh et al., 2019). They also tend to focus on functional rehabilitation, rather than more rights-based goals such as participation and inclusion.

What guidance on AT provision is available to humanitarian actors?

Following the adoption of the CRPD, humanitarian actors, including governments, international and nonprofit organizations, have invested increasing effort toward the development of disability-inclusive emergency preparedness, response, and recovery plans. A range of frameworks and guidelines have been developed to reflect the importance of including people with disability and older people in humanitarian action, to respond to their needs and requirements, and ensure that assistive products are available and affordable across all phases of the emergency cycle. The Sphere Handbook sets key actions and indicators to ensure that "people have access to essential medicines and medical [assistive] devices that are safe, effective and of assured quality"; for example, that 80% of the facilities should be equipped with priority medical devices and assistive products (The Sphere Handbook, 2018). Similarly, the *Guidelines for the domestic facilitation and regulation of international disaster relief and initial recovery assistance*, published

by the International Federation of the Red Cross and Red Crescent Societies, defines the responsibilities of humanitarian actors and the characteristics of initial recovery assistance, which should be “responsive to the special needs, if any, [...] of the elderly, persons with disabilities, and persons living with HIV and other debilitating illnesses” (IFRC, 2014).

More specific guidelines related to health and disability, rehabilitation, and provision of assistive products in humanitarian crisis have been developed by WHO, UNICEF and international and nonprofit organizations such as CBM, Humanity and Inclusion, the ICRC and HelpAge. The *Guidance Note on Disability and Emergency Risk Management for Health* (WHO, 2013), the *Minimum standards for age and disability inclusion in humanitarian action* (Collinson, 2015) and the *Guidance on Including children with disabilities in humanitarian action* (UNICEF, 2017) outline the steps, interventions and standards health actors should follow to ensure that specific support is available for adults and children with disability, as well as older persons. The *Minimum technical standards and recommendations for rehabilitation* (WHO, 2016) includes a list of essential assistive products and rehabilitation equipment for trauma care, as well as minimum rehabilitation skills for trauma rehabilitation (such as prescription and fitting of assistive products). The IASC Guidelines on *Inclusion of Persons with Disabilities in Humanitarian Action* (Inter-Agency Standing, (IASC) ca. 2019) sets out essential actions that humanitarian actors must take across the education, health, livelihoods and WASH sectors in order to effectively respond to the needs of persons with disability, including provision of accessible resources and assistive products.

While all of those resources include important information on what actors should do to address the needs and requirements of persons with disability and older persons in humanitarian action, the extent to which these guidelines have been used to inform and coordinate humanitarian response has not been systematically assessed, and gaps in provision and access remain wide. A study conducted by Humanity & Inclusion in 2015 showed that less than a third of humanitarian actors involved declared having provided AT in emergency settings.

There are several factors that might challenge the effective utilization of AT-related guidelines, and their translation into practice.

The first factor relates to the content of the guidelines and standards themselves, which often describe *what* should be done without providing clear information on *processes* and *resources* required to ensure that the need for assistive products is met – the guidance on “how-to” is lacking. The actions that humanitarian actors should undertake to improve access to AT are not linked to outcomes, or to indicators and processes to achieve targets. Mechanisms to establish and enforce the accountability of different stakeholders are not emphasized. In addition, although collecting data on needs for assistive products is recognized as an important activity, existing guidelines do not define *how* the need for assistive products should be identified in emergency settings, including what data collection tools should be used, what questions should be asked and who should be responsible for translating those data into programme design.

There is a lack of guidance on which assistive products should be prioritized in stockpile policies, or how products should be procured in the acute phase of the emergency

response. The *WHO Minimum technical standards and recommendations for rehabilitation* includes a list of essential assistive products to prioritize in humanitarian crisis (WHO, 2016); however, effective financing mechanisms, procurement strategies, and responsibilities of different humanitarian actors involved in procuring and delivering these products are not described.

One of the biggest gaps in the existing guidelines and standards for inclusive humanitarian action is represented by the lack of information on coordination mechanisms for scaling up service delivery and workforce training in humanitarian contexts. Many highlight the importance of trained staff and service delivery models based on people-centered assessment, fitting of assistive products, use and follow-up; yet, the processes and responsibilities for effective distribution, service provision and staff capacity building options are not included.

The limited attention given to assistive products within globally recognized approaches and tools for humanitarian needs assessment and response management may also be hindering the uptake of those guidelines by humanitarian actors. There are no prompts to include assistive products across key components of the IASC Humanitarian Programme Cycle, such as in the Humanitarian Needs Overview and Humanitarian Response Plans templates. Similarly, there are no minimum standards for assistive products in the Health Cluster Guide – a guide developed by the Cluster lead agency WHO and partners to ensure that all relevant stakeholders can work together during a humanitarian crisis to achieve the aims of reducing avoidable mortality, morbidity and disability.

A further barrier limiting uptake may be a limited focus in some guidelines on how AT (and other health-related services) can be improved and scaled up through system strengthening, particularly national systems. Instead, many guidelines pave the way for the development of parallel systems, which then face a challenge common to many humanitarian interventions: how to hand over sustainable interventions to government or other local responsible agencies in the long-term, and bridge the humanitarian-development continuum.

Establishing mechanisms across agencies for the coordination of processes and resources required for assessment, procurement and service provision of assistive products is key to translate existing guidelines into practice. Water, Sanitation and Hygiene (WASH) programming (UNHCR, 2011) may offer lessons for the development of accessible, practical guidance for provision of AT, including: decision flow diagrams to plan needs assessments, monitoring frameworks, lists of available tools for data collection, and details of the roles and responsibilities of different agencies.

Examples of AT provision in humanitarian settings

Much of the humanitarian guidance on AT provision discusses the responsibilities of humanitarian actors at three phases: preparedness planning, the acute stage of a crisis, and the post-acute or recovery stage. In recent cases such as Syria, Afghanistan and South Sudan, the post-acute phase may lead to a protracted period of many years with periodic escalations or sustained high levels of humanitarian need. Whilst the authors recognize a paradigm shift in humanitarian response

action away from that three-phase humanitarian response framework toward a holistic response strategy to strengthen national systems and support the humanitarian-development programme continuum, this paper follows that three-phase framework to examine the available literature on AT provision at each of these stages of humanitarian crises.

The overwhelming majority of the articles we found did not detail the nature of AT provision in the settings described. Instead, the majority (all but 15) were tagged as background documents (which we classified according to the other themes of the review), included lessons and guidance on inclusion of people with disabilities in disaster response and preparedness (e.g., Ronoh et al., 2015), or descriptions of need (e.g., Iezzoni & Ronan, 2010; Pryor et al., 2018) or disability prevalence in crises (e.g., Mactaggart et al., 2016), which we retained to provide useful contextual information for our review. Several papers were experiential accounts of field experience and not empirical (e.g., Landry et al., 2016; Sheppard & Landry, 2016), though we note such papers can provide rich information of how systems work in practice, that can improve our understanding of provision in practice. We found only 15 academic articles describing specific interventions to provide AT in humanitarian settings, which are discussed below. This paucity reflects indications found elsewhere in the literature – for example, a 2015 systematic literature review of the effectiveness of rehabilitation interventions in natural disasters, which identified 10 relevant studies, of which only 2 referenced the provision of assistive devices (Khan, Amatya, Gosney, Rathore, Burkle Jr et al., 2015b).

Preparedness planning: We found one example in the academic literature of AT stockpiling being included in preparedness planning in settings where humanitarian crises had occurred. This was in Nepal before the 2015 earthquake (Landry et al., 2016) (citing (Patil, 2015)): although there is no evidence of the extent to which the approaches taken met or fell short of AT needs. A WHO report examining disaster preparedness in the Philippines following Typhoon Haiyan found that stockpiles were likely insufficient to meet AT needs (Llewellyn & Lewis Gargett, 2018). However, it should be noted that in resource-constrained LMICs, stockpiling is unlikely to be a realistic solution to preparing for crisis-related AT needs, given that those countries fail in any case to meet even a small fraction of the AT needs that exist pre-crisis, let alone within a crisis. We also note that there are several examples in the literature of AT provision in settings which are disaster-prone or vulnerable, which could be termed part of health system strengthening efforts. While these may not be explicitly identified as part of preparedness-planning, they are in fact crucial parts of AT-related crisis mitigation (e.g., Borg & Östergren, 2015; Magnusson et al., 2013; Ogunkeyede et al., 2017).

Acute stage: Eleven articles described the specifics of AT provision in the immediate aftermath of a crisis. The literature suggests that, where they exist, coordinated rehabilitation services which include AT tend to be provided by foreign teams linked with emergency medical services established to augment or lead overwhelmed national capacity in the acute stage of a crisis, for example, in Haiti (Marie Knowlton et al., 2012) and Iran (Mousavi, Khorasani-Zavareh et al., 2019), where AT interventions were delivered in hospitals through a collaboration between NGOs and national capacity, and in Kashmir (Ali et al., 2010;

Keshkar et al., 2014) where provision primarily via government systems with NGO support was shown to have good outcomes. A paper on the rehabilitation provision in the aftermath of the Haiti earthquake briefly describes how “International partners also supplied hospitals with mobility aids and assistive devices to increase independence and participation for those injured in the earthquakes” (Sheppard & Landry, 2016). One paper described how “within days” of the 2010 earthquake in Haiti, Handicap International (now Humanity and Inclusion) began conducting needs assessments to inform the rehabilitation response, which included prosthetic and orthotic services. Between January and November 2011, 27 providers had provided 1,800 prosthetics, 2,000 braces, over 4,500 wheelchairs and nearly 10,000 walking aids (Marie Knowlton et al., 2012). An Injury Rehabilitation and Disability Working group was established, led by NGOs and partnered with government. The Haitian government led on meeting the needs of those with preexisting disabilities, and the working group addressed the humanitarian rehabilitation response (Marie Knowlton et al., 2012). The paper cites this means of coordination, in which disability was made a focus areas within the UN cluster system, as a key factor in the success of the rehabilitation response (Marie Knowlton et al., 2012). Foreign-accredited professionals working for international NGOs “supervised locally trained Haitian prosthetic and orthotic technicians, physical therapists and rehabilitation technicians,” as well as locating amputees in the community and referring to hospital-based and community-based services (Marie Knowlton et al., 2012).

A study on provision in the Philippines following Typhoon Haiyan describes a number of approaches taken to improve the reach of rehabilitation services including AT (Benigno et al., 2015). This included a CBR initiative delivered through a partnership between WHO, DPOs and government, and a needs assessment conducted by NGO and local experts with support from WHO (Benigno et al., 2015). However, only two papers found included analysis of the quality and effectiveness of that AT provision (and both were related to the interventions in Kashmir). We also found articles detailing examples of poor provision: for example, the “dumping” of inappropriate devices by NGOs following the 2010 earthquake in Haiti (Baranyi & Louis, 2016; Tataryn & Blanchet, 2012).

A study on rehabilitation provision in the aftermath of the Sichuan earthquake in 2008 described how some patients were initially taken to tertiary medical centers across the country, as hospitals in the earthquake zone were heavily disrupted. The government established rehabilitation departments in three hospitals within the earthquake zone to respond to those with severe, disabling injuries, with expert rehabilitation staff being brought in from outside the province. Early rescue and rehabilitation were predictors of the effectiveness of rehabilitation interventions, with included AT provision. Little detail is provided on how AT were procured, but the paper implies AT was distributed within these centralized hospital-based systems (Li et al., 2012).

As most of the available examples of AT provision in crisis relate to provision in the initial acute care stage or through surgical intervention, provision may be narrowly focused on those who acquire impairment as a direct result of the crisis, thereby excluding those that have never been in contact with health workers and have never had their needs identified. This is

despite the fact that in some cases, over two-thirds of those attending rehabilitation services had impairments unrelated to the crisis, for example, after the 2010 Haiti earthquake (Danquah et al., 2015). Nevertheless, there is little acknowledgment in humanitarian agencies' guidance literature that the majority of the caseload with AT needs may come from people with preexisting impairments.

There is no academic literature on AT-related interventions which specifically acknowledge the need to include those who lost their assistive products as a result of the crisis, or to those who had a need that went unidentified and never had an assistive product provided. This is, however, referenced in the gray literature, for example, a report on the Philippines which found that volunteer roving teams working with local rehabilitation professionals were a valuable tool in identifying AT needs for those who needed them replaced following disaster (Llewellyn & Lewis Gargett, 2018). The few examples of interventions found in our literature review corroborates reports of the nature of disability-related provision from implementing agencies. For example, a United Nations Development Programme (UNDP) report on the experiences of people with disabilities in Nepal after the 2015 earthquake found very few programmes that targeted the needs of people with disabilities, *let alone programmes to provide assistive products*. Any programmes that did exist were standalone (as opposed to coordinated or integrated into systematic provision) and had very limited coverage, confined to a minority of the population with disabilities (Lord et al., 2016).

Post-acute stage: We found only six examples providing information on the nature, scale and quality of AT provision in the post-acute stage of crisis – all but one from Haiti following the 2010 earthquake:

- Three papers describe the limitations of NGO-delivered, post-acute AT provision in Haiti, both in terms of quality and reach, while noting the opportunity to turn the influx of rehabilitation resources following the crisis into sustained rehabilitation services (Rauch et al., 2011; Tataryn & Blanchet, 2012; Wolbring, 2011).
- One paper describes the long-term improvements to Haitian rehabilitation services as a result of a focus on health sector recovery, achieved through training of skilled rehabilitation workers, the incorporation of CBR approaches, and use of accreditation schemes to allow local technicians to provide prosthetic and orthotic services (Marie Knowlton et al., 2012).
- One paper uses a survey to measure the success of a wheelchair donation programme in Haiti. The paper finds high levels of use and satisfaction with wheelchairs, but acknowledges the sustainability challenges associated with provision through foreign NGOs (Sumner et al., 2017).
- We also found one paper on rehabilitation programming which included assistive product provision in the aftermath of the Sichuan earthquake in China in 2008. This paper found that a combined Institutional and

Community-Based Rehabilitation programme improved the long-term physical function of those who sustained disabling injuries in the earthquake (X Zhang et al., 2013).

Supplementing the evidence in the academic literature of the nature and scale of AT provision, a review of the gray literature regarding AT provision in South Sudan and Afghanistan² as well as key informant interview (to be detailed in case studies, forthcoming) provided some suggestions of the likely scale, quality and type of provision that exists in humanitarian settings. The gray literature suggests that AT provision in humanitarian settings is led by specialist NGOs and, with the exception of ICRC's physical rehabilitation programming, is at relatively small scale (DFID, 2018).

- The largest scale of AT programming found in the two case-study countries examined, was physical rehabilitation programming led by ICRC; it focused on the distribution of mobility aids. For example, in 2019, ICRC distributed just under 5,000 assistive devices in South Sudan, and over 100,000 in Afghanistan (International Committee of the Red Cross, 2020).
- There are examples of organizations establishing supplementary rehabilitation outreach centers, e.g., the Italian NGO *Organismo di Volontariato per la Cooperazione Internazionale* (OVCI) partnered with ICRC to deliver services in remote parts of South Sudan that ICRC's central services could not reach (International Committee of the Red Cross, 2017).
- Examples were found of community-based rehabilitation approaches that include AT provision led by Humanity and Inclusion (HI) in humanitarian settings. HI have used Disability and Vulnerability Focal Points (DVFP) after crises in Iraq, India, Sri Lanka, and many other locations, to bring AT and rehabilitation services closer to affected communities (Handicap International, 2014).

Furthermore, the gray literature review pointed to the paucity of nationwide, systematic, coordinated efforts to provide AT within a humanitarian coordination system; the only examples of provision found were led by specialist international NGOs such as ICRC, Swedish Committee for Afghanistan, and Humanity and Inclusion (in Afghanistan) and ICRC, Humanity and Inclusion, Light for the World and OVCI/Usratuna in South Sudan.³ In Afghanistan, little evidence was found of AT provision through multi-donor-supported Basic Package of Education Services programme (some provision is theoretically described in programme documents, but informants reported that, in practice, AT services through BPHS were unlikely to be available (Anonymised Interview – International NGO Afghanistan, 2020), and financial assistance was only provided to the war-wounded) (Anonymous, 2020). This corroborates evidence in the literature that the focus of what limited government disability provision exists in

²This review of the gray literature is part of a series of case studies conducted by UNICEF's Office of Research, Innocenti to supplement the findings of a wider literature review of AT in humanitarian settings.

³Specialist, small-scale efforts are not necessarily a bad thing, and may be contextually appropriate, however they may also point to caps in geographic coverage, or gaps in the types of AT provided. For example, ICRC provision is only for mobility devices, meaning that many people with AT needs are excluded from provision.

Afghanistan is the war-wounded, leading to inequitable provision (Trani & Bakhshi, 2009).

We found evidence in the gray literature of active civil society organizations and networks (e.g., the South Sudan Women with Disabilities Network, and Disability Rights Watch Afghanistan). A mapping and survey of 84 OPDs in Afghanistan found that over half of surveyed organization were involved in the repair of mobility devices, 17 were focussed on visual or hearing impairments, and four DPOs were focused on speech impairments (Community Center For The Disabled, British & Irish Agencies Afghanistan Group, 2019). Only 18% supported more than 500 beneficiaries, suggesting that small-scale assistance was the norm (Community Center For The Disabled, British & Irish Agencies Afghanistan Group, 2019).

The gray literature suggests that, in some cases, humanitarian agencies have made efforts to monitor the barriers to AT access and both the reach and types of AT provision by different actors. For example, in Jordan, an active disability taskforce provides some form of coordination and information-sharing regarding services for people with disabilities, including AT (Working Group: Disability Task Force – Jordan [Internet]). As a result of those efforts, HI have been able to conduct an access-to-services assessment for those in Lebanon and Jordan's refugee camps which includes questions on AT needs (Humanity & Inclusion, iMMAP, 2018).

Even though we note that absence of evidence on AT provision is not evidence of absence, our review of the literature indicates that the scale of AT provision in humanitarian settings is likely to be very low (in line with AT provision in LMICs more generally). Furthermore, the provision that exists tends to favor those injured during the immediate aftermath of a crisis – the acute phase. This is perhaps understandable, as humanitarian actors must prioritize urgent needs, and those injured in the crisis (and particularly those who acquire mobility impairments) may be the most visible and accessible to health-care workers. However, the lack of evidence of AT provision beyond the acute stage suggests that people with preexisting impairments who have lost or damaged their assistive products, and those who acquire impairments through the indirect, longer-term effects of disaster, may be excluded from AT provision interventions. The evidence implies that the “specialized provision” track of the “twin track” approach, that is intended to target investments to speak to the specific needs of people with disabilities, is currently experiencing serious under-investment and lack of attention.

While there is a range of innovation happening across the humanitarian sector, in particular in the water and sanitation sector (e.g., the UNICEF accessible latrine slab (UNICEF)) and use of 3D printing (e.g., of prosthesis and orthotics), these have not yet been taken to scale, and there is scant evidence of the effectiveness of these approaches in the humanitarian context in published literature (DFID, 2018).

We also found no specific information on the direct and indirect costs of AT provision where such provision does occur.

Gaps in data and gaps in evidence on data gathering

To date, there are very little data available on the magnitude of AT needs in crises; in part this is because of the lack of evidence on best practice in identification, assessment and reporting of

need from humanitarian contexts. There is no one approach to identifying needs: approaches range from single question self-reporting (‘do you think you need . . . ?), to self-report based on functional limitations and perceived need (e.g., WHO's rapid Assistive Technology Assessment tool – rATA), to clinical and/or, functional assessments, as well as other more indirect sources (Danemyer et al. 2020). Of the limited data available from humanitarian contexts, most come from clinical assessments (e.g., data collected by EMTs). Further research is needed to establish which of those offers a fast and reliable method of collecting data about AT needs (met, under-met or unmet) in humanitarian contexts. Ongoing work on piloting the rATA in a range of humanitarian contexts may provide some evidence to support this. Other options might be the use of algorithm-based tools, whereby a survey enumerator follows a set of questions in a pre-programmed app (there are already some trials of potential apps, such as the “decision tree” algorithm being developed by LSHTM (part of AT2030) to assess AT needs, and more advanced self-reporting via a website which then lists examples of suitable AT, where it is available and even its cost, e.g., the Israeli website “ATvisor” (<https://www.atvisor.ai/en>).

Both the rATA and the AT needs assessment decision tree are based on the Washington Group Short Set Questions (WGSSQ) which assess functional capacity (Disability Statistics in Humanitarian Action, 2019). However, a recent NGO-led study on using the WGSSQ in humanitarian contexts has shown that they are not suitable for every situation or context and that organizations need to be clear about the needs and objectives of collecting data on persons with disabilities and understand the strengths and limitations of using the questions sets (LC/HI 2019). Using those tools may give a predictor of need and type of AT need (met, under-met or unmet), but caution should be shown in assuming that merely providing AT enables equitable inclusion for adults and children with disabilities. Conversely, assessment for AT needs may lead to expectations of provision that cannot be met.

A further gap is that existing measures largely focus on access and provision, rather than linking to broader outcomes. For example, while there may be existing data on prevalence of limb injuries, and even on the type of prosthesis needed, there is almost no data relating to how the provision of those prosthesis enabled or improved access to education, employment or essential services. This is in part because of the measurement challenges of attributing causality, which could have many determining factors. Merely providing someone with AT does not guarantee them participation or inclusion, and so stronger outcome-focussed evidence might provide a more substantive case for securing future funding and prioritization for AT, as well as align with rights-based approaches of engagement, participation and inclusion of persons with disabilities within the humanitarian innovation ecosystem.

There are also relatively sparse data on the intersection of AT needs with needs in other cross-cutting aspects of humanitarian response, or how that intersectionality impacts outcomes, e.g., what is the effect of age and sex on AT needs, access to AT and the impact of AT? One study from Pakistan explores the role of gender in recovery from new spinal cord injuries (SCI) sustained as a result of the earthquake in 2005 (Irshad et al., 2012). Though

not specifically focusing on AT, the study documents long-term impacts, which predominantly affected women, who are more socially vulnerable to the impacts of disasters. Of the number of patients diagnosed with SCI, 65–74% were women (as cited in (Irshad et al., 2012): 452). The study documents how women, who have access to wheelchairs or other AT, remain dependent on others for their care, resulting in many being abandoned by their husbands, or their husbands taking a second wife to care for the first wife. The same was rarely true where males had SCI. More data on these longer-term impacts would help understand what level of support (including, but not only, financial) persons with new and preexisting impairments are likely to need over the long term – including skills training and other mechanisms to foster resilience.

Despite growing awareness of the need to ensure collaboration with affected populations, we found no academic evidence of co-designing AT in humanitarian contexts.

Challenges to AT provision in humanitarian settings

Given the evidence that AT provision falls critically short of meeting needs in humanitarian contexts, despite the requirements for provision detailed in humanitarian guidance, we reviewed the literature on the barriers that constrain provision.

We identified four broad challenges constraining AT access and provision: (1) challenges within the preexisting context; (2) challenges caused by the humanitarian crisis; (3) limitations of the crisis response; (4) challenges associated specifically with assistive product provision.

Challenges within the preexisting context

There tends to be limited and poor-quality preexisting health infrastructure in LMICs that tend to be the settings for many humanitarian crises (Iezzoni & Ronan, 2010; Landry et al., 2010; Mills et al., 2018); those settings also tend to have a lack of trained personnel to deliver health and rehabilitation services (Iezzoni & Ronan, 2010; Lord et al., 2016; Marie Knowlton et al., 2012). Rehabilitation services are rarely a government priority (Durham et al., 2016; Mousavi, Khorasani-Zavareh et al., 2019; Physiotherapy, 2015; World Health Organization, 2014), and, in general, healthcare financing is low (Van Niekerk et al., 2019). This is reflected in the fact that there is often no senior leader responsible for rehabilitation services within the Ministry of Health (e.g., Mousavi, Khorasani-Zavareh et al., 2019).

There tends to be a very limited preexisting AT market in the LMICs where humanitarian crises occur: for example, before the 2010 earthquake, Haiti had low capacity for assistive device production, and following the disaster struggled to source even the most basic low-cost products to meet AT needs (Iezzoni & Ronan, 2010).

There is likely to be a high level of stigma associated with disability and use of AT (Marie Knowlton et al., 2012), preventing families and individuals from seeking the AT that they need (Adugna et al., 2020). Prejudiced views about people with disabilities may also be held by government workers which may result in a failure to prioritize AT needs (Borg & Östergren, 2015). Further, people with AT needs and their

families often have little knowledge on their rights, and limited knowledge of available products and services, how to access them, and their benefits (Hettiarachchi et al., 2019; Pryor et al., 2018; Weerasinghe et al., 2015). Such demand-side barriers naturally have a negative impact on supply.

People in humanitarian settings may also be unable to access AT because of poverty. Healthcare costs, and costs of travel to AT facilities and services are often very high (Al-Obaidi & Budosan, 2011; Magnusson et al., 2013; Redmond et al., 2011; Weerasinghe et al., 2015), particularly as they may be far from the rural areas where many people with AT needs live (Al-Obaidi & Budosan, 2011; Benigno et al., 2015; Borg, Larsson et al., 2012; Borg, Östergren et al., 2012; Mousavi, Khorasani-Zavareh et al., 2019).

Poverty, stigma, and other barriers to AT access are likely to affect different groups to greater and lesser extents. There may be “hierarchies” of disability (Miles & Singal, 2010): for example, in some contexts people with intellectual impairments may face greater stigma than people with mobility challenges (Miles & Singal, 2010; Tilahun et al., 2016). There may also be other social hierarchies which affect access to services, e.g., in one study it was found that 98% of those receiving a prosthetic device as a result of a landmine were men (Rios et al., 2014). As noted above, for those at the intersection of multiple stigmatized or marginalized groups, barriers to access are likely to be even greater.

Challenges caused by the crisis

In a humanitarian emergency, already-weak systems are placed under enormous pressure and are rarely able to scale up to meet growing demand in an increasingly complex environment. Crises can lead to the damage or loss of existing infrastructure, including the health and transport infrastructure that underpins AT and rehabilitation services (Bar-On et al., 2011; Walsh et al., 2014). Conflict and crisis may render travel to health-care services dangerous (Gohy et al., 2016). Skilled health-care professionals may leave the affected country or region, limiting service provision further. Humanitarian crises also lead to government resources being redirected to emergency response – so any AT or rehabilitation services which may have existed before may be reduced. Humanitarian crises can cause economic downturns, which further limit governments’ ability to provide health services.

Populations displaced by crisis may face particular barriers to AT access. People who cross borders or who live in non-government-controlled areas may not have access to national services due to administrative obstacles. For populations who are living in camps, including in the context of enforced encampment policies (as in some refugee-hosting countries), access can be hindered by movement restrictions or by being located far from service centers. In a very practical sense, language barriers can be an obstacle to navigating often complex service systems.

Limitations of the crisis response

Coordination mechanisms often do not provide clarity on who is responsible for AT provision in crises (Tataryn & Blanchet,

2012), and, therefore, offer little accountability for provision. There is often little coordination of rehabilitation services (Mousavi, Ardalan et al., 2019; Sheikhbardsiri, 2017), or of international medical teams (Bar-On et al., 2011) through which AT services are typically provided.

Similarly, after a humanitarian crisis, the sudden increase in NGOs and resources may create challenges for the coordination of rehabilitation services (Trudeau & Rothstein, 2016) and may lead to the development of parallel provision systems that are not coordinated with national systems (Gosney et al., 2011).

Humanitarian actors often fail to gather data on disability and AT needs (Redmond et al., 2011; Stough & Kang, 2015); where they do, they may have inconsistent approaches to that data gathering, or do not have the capacity to interpret the findings, or act upon them if they do. This limits responsible agencies' ability to plan and implement AT programmes, and monitor and evaluate those programmes (Redmond et al., 2011; Stough & Kang, 2015).

Where AT provision programmes are in place, they are often led by NGOs using models of provision that may not be evidence-based. These include charitable donations of assistive products which are provided without consideration of needs or appropriateness and without being accompanied by necessary services (Patil, 2015; Tataryn & Blanchet, 2012). There is no evidence of the sustainability of NGO-led AT provision interventions (Rohwerder, 2018; Visagie et al., 2018). The use of NGOs in AT provision may exacerbate the impression that AT is a charitable benefit rather than a right.

Historically, there is evidence that acute care is prioritized over early rehabilitation in crises (Khan, Amatyia, Gosney, Rathore, Burkle Jr et al., 2015b; Mills et al., 2018), which is likely to lead to underinvestment in AT. Furthermore, even organizations of people with disabilities (OPDs) often prioritize other needs such as access to food – over AT (Tataryn & Blanchet, 2012). Sometimes, the lack of AT provision may reflect prejudiced attitudes by those who are responsible for providing the necessary services (Llewellyn & Lewis Gargett, 2018). Specialist services for people with disabilities are sometimes considered “complex, long-term and non-life threatening” and are, therefore, potentially not seen as part of the task of humanitarian service provision (Mirza, 2015).

There is often a disparity between the types of AT needed and the AT that humanitarian agencies prioritize (Tataryn & Blanchet, 2012). For example, after the Haitian earthquake in 2010, most organizations providing rehabilitation services were orthosis or prosthesis providers, despite the relatively smaller number of impairments caused by amputation (Marie Knowlton et al., 2012; Tataryn & Blanchet, 2012).

Challenges of AT provision

Assistive products have features that may make them more challenging to provide at scale in humanitarian settings than other essential humanitarian products and services, which when coupled with the barriers described above may limit humanitarian agencies' readiness to instigate programmes to scale up AT. Assistive products are expensive compared with many other humanitarian products. Few low-tech, low-cost assistive products have been developed that are affordably

scalable in crisis contexts (Borg & Östergren, 2015; S Brown et al., 2020). Assistive products also have ongoing costs associated with repair, upkeep, and replacement (Iezzoni & Ronan, 2010; Sharma, 2015). AT products need to be tailored both to the user and to the setting, and must not be provided using a “one size fits all” approach, as they may also require modification, adaptation and refitting over time. AT provision for children exemplifies this challenge: assistive products are *particularly* costly for children, as they will need to be regularly replaced as they are outgrown (Iezzoni & Ronan, 2010); prosthetic replacements are usually required annually up to age 5, biannually up to age 12, then every 3–4 years until age 21. Those challenges are exacerbated by the physical environment, making products developed for high-income countries, and even developing LMICs, inappropriate. This increases the likelihood of assistive products being abandoned (S Brown et al., 2020). All those factors make AT for humanitarian settings particularly expensive to procure, distribute and maintain.

Furthermore, AT needs in humanitarian contexts are both unpredictable and diverse, which is a challenge for efficient and effective procurement. There is little evidence to guide humanitarian actors in predicting likely levels of AT need following a crisis, and the volumes and types of need are likely to be highly dependent on the type of crisis and the setting. There is a broad range of assistive products to meet different needs, with no minimum standards for their manufacture and design. This reduces the viability of cost-effective, fast, large-scale procurement. The literature suggests that AT provided in humanitarian settings is often not suitable for the specific context and is substandard (Rohwerder, 2018). It is also rarely accompanied by appropriate services or support (Rohwerder, 2018).

Facilitators of AT provision in humanitarian settings

As we found no evidence that described or compared different models of at-scale AT provision in humanitarian settings, we also did not find evidence of “what works” to improve AT provision. However, the literature suggests some principles which may offer facilitating factors to improve the quality and scale of AT provision in humanitarian settings. While these principles may be helpful, they are unlikely to be sufficient to meeting the full gap in AT needs in humanitarian settings, as they do not address many of the structural barriers identified in this review.

International support in humanitarian crises must be designed to strengthen and sustain existing health systems by integrating rehabilitation and AT provision into emergency response. Some strategies to do this include deploying rehabilitation professionals within or alongside EMTs (Sheppard & Landry, 2016) to facilitate early rehabilitation (Ali et al., 2010) and developing field hospitals into permanent centers that can provide long-term rehabilitation (Keshkar et al., 2014). Systems can also be sustainably strengthened by integrating AT provision into approaches that bring services as close as possible to communities, such as community-based rehabilitation models (Blanchet et al., 2017; Bongo et al., 2018; Gosney Jr. & O'Connell, 2009; Handicap International, 2014), as well as local identification, recruitment and training of AT personnel

(De Witte et al., 2018). One study found that benefits of CBR for children with disabilities in Zimbabwe included the provision of AT (such as wheelchairs) as well as advice about home physiotherapy. However, despite some reported positive impacts on the community, the local government had not taken over the funding of the CBR programme which led to its decline. Although the evidence base for the impact of CBR is weak (Bright et al., 2018), there is some indication that it may be a useful approach in humanitarian settings (World Health Organization, 2010).

AT provision can also be strengthened by including AT responsibilities into coordination structures. Humanitarian coordination (e.g., IASC Clusters) should have a clear, designated “space” for AT provision (Landry et al., 2016) with oversight from a government agency (among others) (Marie Knowlton et al., 2012). One of the lessons from the 2010 Haiti earthquake was the benefit of having a disability sub-cluster (Marie Knowlton et al., 2012). Evidence indicates that such coordination structures must fully involve local stakeholders in the provision of rehabilitation services (L Zhang et al., 2012). They must integrate all responsible actors into coordination, including government, civil society organizations and international agencies (Anonymous, 2020). While there are sustainability risks associated with reliance on NGOs to deliver services, it should be noted that NGOs are likely to have expertise in negotiating AT procurement at lower costs than other actors (ATscale, 2019).

Humanitarian agencies must also implement systems to gather data on those with unmet AT needs, not just those who receive emergency care. On their own, tools such as the WGSSQ (Washington Group on Disability Statistics, 2014), the rATA tool (Global call for measuring access to assistive technology using the WHO rapid Assistive Technology Assessment (rATA) questionnaire [Internet], 2005) and clinical diagnostic tools may only provide limited evidence on AT needs – but when these tools are administered together, they may provide valuable information to use as an advocacy and inform provision. Tracking systems and databases of injuries have been found to be valuable (Ali et al., 2010; Gosney Jr. & O’Connell, 2009; Landry et al., 2016) in meeting AT needs – although types of patient registries may fail to capture those with AT needs who never receive acute care, and registries may even put patients in danger if they identify those who may be perceived as combatants. Gathering and publishing information on AT services (e.g., in a public directory), as well as information on rights to services (Tanabe et al., 2015), may also improve demand, access, and take-up of services (Benigno et al., 2015; Landry et al., 2016; De Witte et al., 2018, 2018).

What activities are in progress to scale up and improve the quality of AT provision in humanitarian settings?

Since the CRPD entered into force, several new initiatives have been instigated that aim to improve the evidence base and guidance to meet the need for AT globally. These include:

- UNICEF and WHO-led data collection on levels of AT need, demand, and barriers to access in humanitarian contexts, using the WHO rapid Assistive Technology Assessment survey (rATA) (ongoing). That information

is aimed to support the planning of assistive products selection, procurement, and service delivery.

- The development of a model list of priority assistive products for humanitarian action led by WHO and UNICEF.
- UNICEF and WHO, within the AT2030 programme, have developed Assistive Product Specifications (for 27 assistive products) and a Procurement Manual to support countries in procuring quality and affordable assistive products. UNICEF, WHO and other partners held consultations and workshops to assess the usability of these resources in humanitarian contexts and evaluate potential adaptations.
- Global initiatives from AT2030 and ATScale which aim to commission research and programmes to better understand how the AT market can be shaped to scale up access and provision of AT in LMICs (ongoing).

Recommendations

Next steps

- An AT Provision and Coordination Framework for humanitarian settings should be developed, which, as a priority, must include:
 - Information on need, unmet need, demand, barriers and enablers to access AT in a range of different humanitarian settings;
 - details of interagency responsibilities for AT provision and humanitarian coordination for AT provision, under different models of coordination, including the cluster system and refugee coordination model, at every stage of crisis; and including settings with weak or absent national government.
 - details of minimum standards for *how* interagency responsibilities should be enacted, based on evidence of best practice (e.g., minimum requirements for needs assessment approaches, financing, programming), that considers the varied needs of *all* groups with AT needs, including those who were born with an impairment or acquired an impairment before the crisis, or as a result of the long-term impacts of the crisis.
- Explicit incorporation of assistive products and services into emergency preparedness planning and humanitarian response.
- Establish a multi-stakeholder taskforce to take forward the recommendations of the AT Framework, and the recommendations below, and to build capacity of humanitarian actors; embed AT-related issues into key IASC and Cluster Lead Agency guidance, tools and processes, including to establish mechanisms for monitoring AT need and access; document effective models of coordination, including coordination with national systems in a variety of different humanitarian settings.

Longer-term recommendations

- Donors and multilateral agencies should ringfence humanitarian and development funding for effective, coordinated and inclusive AT provision. This funding should consider the facilitators of improved provision outlined in this paper,

and should aim to strengthen sustainable national systems of AT provision in fragile states, protracted crises and in countries hosting large refugee populations, in order to enable scale-up in an emergency and to ensure coverage of all affected populations. And to consider the role of development agencies in sustained provision, especially in cases with weak or absent national governments.

- Humanitarian procurement teams should rapidly expand supply catalogs (e.g., the UNICEF supply catalog) to include a range of assistive products based on the WHO humanitarian priority assistive products list.
- Donors and multilateral agencies should make monitoring and evaluation a requirement of all new programming which includes an AT provision component, in order to build the evidence base on “what works” to scale up and improve the quality of AT provision.
- More research is required on both pilot and at-scale interventions (e.g., those implemented by HI and ICRC) to measure:
 - outcomes across range of domains (e.g., participation, inclusion in health, education, etc.).
 - types of products that have been effectively procured and distributed in crisis, and the mechanisms for delivery and scale-up, including digital tools.
 - the best mechanisms for procurement, supply, distribution, as well as follow-up services (including rehabilitation, occupational therapy, repair and adjustments).
 - The challenges, opportunities and impacts of incorporating AT products and services into emergency preparedness planning and humanitarian response.
 - Intersectionality of programming (age, gender, disability, etc.) in support of disability outcomes and impacts

References

- Adugna, M. B., Nabbouh, F., Shehata, S., & Ghahari, S. (2020, January 6). Barriers and facilitators to healthcare access for children with disabilities in low and middle income sub-Saharan African countries: A scoping review. *BMC Health Services Research* [Internet], 20(15), 1–11. <https://link.springer.com/article/10.1186/s12913-019-4822-6>
- Ali, I., Mir, A. A., Jabeen, R., Ahmad, M., Fazili, A., Kaul, R. R., Kumar, R., & Keshkar, S. (2010, January). Morbidity pattern and impact of rehabilitative services in earth quake victims of Kashmir, India. *International Journal of Health Sciences (Qassim)* [Internet], 4(1), 59–67. Retrieved July 16, 2020, from <http://www.ncbi.nlm.nih.gov/pubmed/21475527>
- Al-Obaidi, A. K., & Budosan, B. (2011, January 22). Mainstreaming educational opportunities for physically and mentally disabled children and adolescents in Iraq. *Advances in School Mental Health Promotion* [Internet], 4(1), 35–43. Retrieved April 28, 2020, from <https://www.tandfonline.com/doi/abs/10.1080/1754730X.2011.9715621>
- Anonymised Interview - International NGO Afghanistan. (2020).
- Anonymous. (2020). *Anonymised interview - Afghan civil society organisation for people with disabilities*.
- ATscale. (2019, December). *Product narrative: Hearing aids - A market landscape and strategic approach to increasing access to hearing aids and related services in low and middle income countries*. www.atscale2030.org. <https://atscale2030.org/product-narratives>
- Baranyi, S., & Louis, I. (2016, October). (Dis)ability and development in Haiti: Beyond one-dimensional views. *Third World Thematics: A TWQ Journal* [Internet], 1(3), 321–334. Retrieved July 16, 2020, from <https://www.tandfonline.com/action/journalInformation?journalCode=rtwt20http://dx.doi.org/10.1080/23802014.2016.1216328>
- Bar-On, E., Lebel, E., Kreiss, Y., Merin, O., Benedict, S., Gill, A., Lee, E., Pirotsky, A., Shirov, T., & Blumberg, N. (2011, October 1). Orthopaedic management in a mega mass casualty situation. the Israel defence forces field hospital in Haiti following the January 2010 earthquake. *Injury* [Internet], 42(10), 1053–1059. Retrieved July 17, 2020, from [https://www.injuryjournal.com/article/S0020-1383\(11\)00147-1/abstract](https://www.injuryjournal.com/article/S0020-1383(11)00147-1/abstract)
- Benigno, M. R., Kleinitz, P., Calina, L., Alcido, M. R., Gohy, B., & Hall, J. L. (2015, November). Responding to the health and rehabilitation needs of people with disabilities post-Haiyan. *Western Pacific Surveillance and Response Journal*, 6(S1), 53–59. https://doi.org/10.5365/wpsar.2015.6.2.HYN_010
- Blanchet, K., Ramesh, A., Frison, S., Warren, E., Hossain, M., Smith, J., Knight, A., Post, N., Lewis, C., Woodward, A., Dahab, M., Ruby, A., Sistenich, V., Pantuliano, S., & Roberts, B. (2017, November 18). Evidence on public health interventions in humanitarian crises. *The Lancet* [Internet], 390(10109), 2287–2296. [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(16\)30768-1/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)30768-1/fulltext)
- Bongo, P. P., Dziruni, G., & Muzenda-Mudavanhu, C. (2018, April 17). The effectiveness of community-based rehabilitation as a strategy for improving quality of life and disaster resilience for children with disability in rural Zimbabwe. *Jamba: Journal of Disaster Risk Studies* [Internet], 10(1), 1–10. Retrieved May 1, 2020, from <https://jamba.org.za/index.php/jamba/article/view/442>
- Borg, J., Larsson, S., & Östergren, P.-O. (2011, February 25). The right to assistive technology: For whom, for what, and by whom? *Disability & Society* [Internet], 26(3), 151–167. Retrieved May 11, 2020, from <https://www.tandfonline.com/doi/abs/10.1080/09687599.2011.543862>
- Borg, J., Larsson, S., Östergren, P.-O., Atiqur Rahman, A. S. M., Bari, N., & Noman Khan, A. H. M. (2012, September). Assistive technology use and human rights enjoyment: A cross-sectional study in Bangladesh. *BMC International Health and Human Rights* [Internet], 12(18), 1–11. Retrieved May 12, 2020, from <https://pubmed.ncbi.nlm.nih.gov/22992413/>
- Borg, J., & Östergren, P.-O. (2015, July 1). Users’ perspectives on the provision of assistive technologies in Bangladesh: Awareness, providers, costs and barriers. *Disability and Rehabilitation. Assistive Technology* [Internet], 10(4), 301–308. Retrieved May 12, 2020, from <https://www.tandfonline.com/doi/abs/10.3109/17483107.2014.974221?journalCode=iidt20>
- Borg, J., Östergren, P.-O., Larsson, S., Atiqur Rahman, A. S. M., Bari, N., & Noman Khan, A. H. M. (2012, March). Assistive technology use is associated with reduced capability poverty: A cross-sectional study in Bangladesh. *Disability and Rehabilitation. Assistive Technology* [Internet], 7(2), 112–121. Retrieved May 12, 2020, from <https://pubmed.ncbi.nlm.nih.gov/21851288/>
- Bright, T., Wallace, S., Kuper, H., & Systematic, A. (2018, October 2). Review of access to rehabilitation for people with disabilities in low- and middle-income countries. *International Journal of Environmental Research and Public Health* [Internet], 15(10), 1–34. Retrieved July 22, 2020, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6210163/>
- Brown, H. K., Carty, A., Haverkamp, S. M., Parish, S., & Lunskey, Y. (2020). Identifying reproductive-aged women with physical and sensory disabilities in administrative health data: A systematic review. *Disability and Health Journal*, 13 (3), 100909. Elsevier Inc. <https://doi.org/10.1016/j.dhjo.2020.100909>
- Brown, S., Vairis, A., Masoumifar, A. M., & Petousis, M. (2020, February 1). Common problems with the conventional design of crutches: Proposing a safer design and discussing the potential impact. *Technology in Society* [Internet], 60(101215), 1–9. Retrieved April 6, 2020, from <https://www.sciencedirect.com/science/article/pii/S0160791X1930288X>
- Collinson, S. (2015). *Minimum standards for age and disability inclusion in humanitarian action. Pilot Version* [Internet]. ADCAP (Age and Disability Capacity Building Programme). Retrieved May 13, 2020, from <http://www.christianaid.org.uk/sites/default/files/2016-03/minimum-standards-for-age-and-disability-inclusion-2015.pdf>
- Community Center For The Disabled, British & Irish Agencies Afghanistan Group. (2019, March). *Mapping of Disabled Persons’ Organisations (DPOs) in Afghanistan* [Internet]. British & Irish

- Agencies Afghanistan Group. Retrieved August 11, 2020, from <https://www.baag.org.uk/resources>
- Danquah, L., Polack, S., Brus, A., Mactaggart, I., Perrin Houdon, C., Senia, P., Gallien, P., & Kuper, H. (2015, June 1). Disability in post-earthquake Haiti: Prevalence and inequality in access to services. *Disability and Rehabilitation* [Internet], 37(12), 1082–1089. Retrieved April 27, 2020, from <https://www.tandfonline.com/doi/abs/10.3109/09638288.2014.956186>
- De Witte, L., Steel, E., Gupta, S., Ramos, V. D., Roentgen, U., Delgado Ramos, V., et al. (2018, May 9). Assistive technology provision: Towards an international framework for assuring availability and accessibility of affordable high-quality assistive technology. *Disability and Rehabilitation. Assistive Technology* [Internet], 13(5), 467–472. Retrieved July 18, 2020, from <https://www.tandfonline.com/doi/full/10.1080/17483107.2018.1470264>
- Devakumar, D., Birch, M., Osrin, D., Sondorp, E., & Wells, J. C. K. (2014, April 2). The intergenerational effects of war on the health of children. *BMC Medicine* [Internet], 12(57), 1–15. Retrieved April 28, 2020, from <https://link.springer.com/article/10.1186/1741-7015-12-57>
- DFID. (2018, June). *Scoping research report on assistive technology: On the road for universal assistive technology* [Internet]. DFID. Retrieved August 2, 2020, from <https://www.clasphub.org/wp-content/uploads/2020/03/Scoping-Research-Report-on-AT.pdf>
- Disability Statistics in Humanitarian Action. (2019). *Humanity & Inclusion UK* [Internet]. Retrieved November 4, 2020, from <https://humanity-inclusion.org.uk/en/projects/disability-data-in-humanitarian-action>
- Durham, J., Sychareun, V., Santisouk, P., & Chaleunvong, K. (2016, November). Users' satisfaction with prosthetic and orthotic assistive devices in the Lao People's Democratic Republic: A cross-sectional study. *Disability, CBR and Inclusive Development* [Internet], 27(3), 24–44. <http://dcidj.org/article/view/553>
- Elrha. (2020). *Gap Analysis: The inclusion of people with disability & older people in humanitarian response* [Internet]. Retrieved November 12, 2020, from <https://www.elrha.org/researchdatabase/gap-analysis-humanitarian-inclusion-disabilities-older-people-literature-review/>
- Global call for measuring access to assistive technology using the WHO rapid Assistive Technology Assessment (rATA) questionnaire [Internet]. (2005). Retrieved November 4, 2020, from <https://unstats.un.org/unsd/demographic/sources/surveys/Handbook23June05.pdf>
- Gohy, B., Ali, E., Van den Bergh, R., Schillberg, E., Nasim, M., Naimi, M. M., Cherástal, S., Falipou, P., Weerts, E., Skelton, P., Van Overloop, C., & Trelles, M. (2016, November). Early physical and functional rehabilitation of trauma patients in the Médecins Sans Frontières trauma centre in Kunduz, Afghanistan: Luxury or necessity? *International Health* [Internet], 8(6), 381–389. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5181549/>
- Gosney, J., Reinhardt, J. D., Haig, A. J., & Li, J. (2011, November). Developing post-disaster physical rehabilitation: Role of the World Health Organization Liaison Sub-committee on rehabilitation disaster relief of the international society of physical and rehabilitation medicine. *Journal of Rehabilitation Medicine: Official Journal of the UEMS European Board of Physical and Rehabilitation Medicine* [Internet], 43(11), 965–968. Retrieved May 1, 2020, from <http://www.medicaljournals.se/jrm/content/?doi=10.2340/16501977-0890>
- Gosney Jr., J. E., & O'Connell, C. (2009). Rehabilitation of disaster casualties. In K. L. Koenig & C. H. Schultz (Eds.), *Koenig and Schultz's disaster medicine: Comprehensive principles and practices* [Internet] (pp. 376). Cambridge University Press. Retrieved April 6, 2020, from <https://books.google.com/books?hl=en&id=zffUCwAAQBAJ&oi=fnd&pg=PA376&dq=%22assistive+technology%22+AND+%22humanitarian+crisis%22+OR+%22humanitarian+coordination%22+OR+%22humanitarian+agency%22+OR+%22humanitarian+disaster%22+OR+%22humanitarian+context>
- Handicap International. (2014, May). *The Disability and Vulnerability Focal Points (DVFP)* [Internet]. Handicap International (HI). Retrieved June 9, 2020, from http://www.hiproweb.org/uploads/tx_hidrtdocs/PG14_DVFP.pdf
- Hettiarachchi, S., Subramaniam, V., Rajah, E., Gowritharan, P., Nizar, S., & Saleem, S. (2019). 'Enabling access': A pilot study on access and use of assistive products in the Northern Province, Sri Lanka. *Disability, CBR and Inclusive Development* [Internet], 30(3), 82–112. Retrieved April 7, 2020, from <http://dcidj.org/article/view/842>
- Humanity & Inclusion, iMMAP. (2018, July). *Removing barriers. The path towards inclusive access. Disability assessment among Syrian refugees in Jordan and Lebanon* [Internet]. Humanity & Inclusion and iMMAP. Retrieved May 29, 2020, from https://re.tc/disability_dashboards
- Iezzoni, L. I., & Ronan, L. J. (2010, June 15). Disability legacy of the Haitian earthquake. *Annals of Internal Medicine* [Internet], 152(12), 812–814. Retrieved May 28, 2020, from <https://www.acpjournals.org/doi/10.7326/0003-4819-152-12-201006150-00234>
- IFRC. (2014). *Guidelines for the domestic facilitation and regulation of international disaster relief and initial recovery assistance*. Retrieved November 11, 2020, from <http://www.ifrc.org>
- Improving social inclusion and empowerment for people with disabilities in low- and middle-income countries: Why does it matter and what works? GOV.UK [Internet]. (2018) Retrieved November 12, 2020, from <https://www.gov.uk/research-for-development-outputs/improving-social-inclusion-and-empowerment-for-people-with-disabilities-in-low-and-middle-income-countries-why-does-it-matter-and-what-works>
- Inter-Agency Standing, (IASC) C. (2019, July). *IASC guidelines, inclusion of persons with disabilities in humanitarian action* [Internet]. Inter-Agency Standing Committee (IASC). <https://interagencystandingcommittee.org/iasc-task-team-inclusion-persons-disabilities-humanitarian-action/documents/iasc-guidelines>
- International Committee of the Red Cross. (2017, November). *Physical rehabilitation programme 2016* [Internet]. Annual Report 2016. Retrieved August 11, 2020, from <https://www.icrc.org/en/publication/physical-rehabilitation-programme-annual-report-2016>
- International Committee of the Red Cross. (2020, June). *Physical rehabilitation programme 2019* [Internet]. 2019 Annual Report. Retrieved August 10, 2020, from <https://www.icrc.org/en/publication/4451-physical-rehabilitation-programme-2019-annual-report>
- Ioerger, M., Flanders, R. M., Goss, K. D., & Turk, M. A. (2019, April). Developing a systematic search strategy related to people with disability: A brief report testing the utility of proposed disability search terms in a search about opioid use. *Disability and Health Journal*, 12(2), 318–322. <https://doi.org/10.1016/j.dhjo.2018.11.009>
- Irshad, H., Mumtaz, Z., & Levay, A. (2012, July 1). Long-term gendered consequences of permanent disabilities caused by the 2005 Pakistan earthquake. *Disasters* [Internet], 36(3), 452–464. Retrieved November 4, 2020, from <https://doi.org/10.1111/j.1467-7717.2011.01265.x>
- Keshkar, S., Kumar, R., & Bharti, B. B. (2014, July 4). Epidemiology and impact of early rehabilitation of spinal trauma after the 2005 earthquake in Kashmir, India. *International Orthopaedics* [Internet], 38(10), 2143–2147. Retrieved July 16, 2020, from <https://pubmed.ncbi.nlm.nih.gov/24993652/>
- Khan, F., Amatya, B., Gosney, J., Rathore, F. A., & Burkle, F. M. (2015a, September). Medical rehabilitation in natural disasters: A review. *Archives of Physical Medicine and Rehabilitation* [Internet], 96(9), 1709–1727. Retrieved May 5, 2020, from <http://dx.doi.org/10.1016/j.apmr.2015.02.007>
- Khan, F., Amatya, B., Gosney, J., Rathore, F. A., & Burkle Jr, F. M. (2015b, September 1). Medical rehabilitation in natural disasters: A systematic review. *Archives of Physical Medicine and Rehabilitation* [Internet], 96(9), 1709–1727. Retrieved April 6, 2020, from [https://www.archives-pmr.org/article/S0003-9993\(15\)00140-9/fulltext](https://www.archives-pmr.org/article/S0003-9993(15)00140-9/fulltext)
- Landry, M. D., O'Connell, C., Tardif, G., & Burns, A. (2010, July 1). Post-earthquake Haiti: The critical role for rehabilitation services following a humanitarian crisis. *Disability and Rehabilitation* [Internet], 32(19), 1616–1618. Retrieved May 22, 2020, from <https://www.tandfonline.com/action/journalInformation?journalCode=idre20>
- Landry, M. D., Sheppard, P. S., Leung, K., Retis, C., Salvador, E. C., & Raman, S. R. (2016, November 1). The 2015 Nepal earthquake(s): Lessons learned from the disability and rehabilitation sector's preparation for, and response to, natural disasters. *Physical Therapy* [Internet], 96(11), 1714–1723. Retrieved April 27, 2020, from <http://www.ncbi.nlm.nih.gov/pubmed/27277496>
- Li, Y., Reinhardt, J. D., Gosney, J. E., Zhang, X., Hu, X., Chen, S., Ding, M., & Li, J. (2012). Evaluation of functional outcomes of physical

- rehabilitation and medical complications in spinal cord injury victims of the Sichuan earthquake. *Journal of Rehabilitation Medicine : Official Journal of the UEMS European Board of Physical and Rehabilitation Medicine* [Internet], 44(7), 534–540. Retrieved November 14, 2020, from <https://pubmed.ncbi.nlm.nih.gov/22674233/>
- Llewellyn, G., & Lewis Gargett, A. (2018, December). *Building capacity in health-related rehabilitation services for health emergency responses December 2016 – November 2018* [Internet]. WHO Collaborating Centre in Health Workforce Development in Rehabilitation and Long Term Care. https://www.sydney.edu.au/content/dam/corporate/documents/faculty-of-medicine-and-health/research/centres-institutes-groups/who-collaborating-centre/12-report-on-rehabilitation-and-health-emergency-response_llewellyn_lewis_gargett_dec2018.pdf
- Lord, A., Sijapati, B., Baniya, J., Chand, O., & Ghale, T. (2016, May). *Disaster, disability, & difference: A study of the challenges faced by persons with disabilities in post-earthquake Nepal*. United Nations Development Programme.
- MacLachlan, M., & Scherer, M. J. (2018, July 4). Systems thinking for assistive technology: A commentary on the GREAT summit. *Disability and Rehabilitation. Assistive Technology* [Internet], 13(5), 492–496. Retrieved April 6, 2020, from <https://doi.org/10.1080/17483107.2018.1472306>
- MacTaggart, I., Kuper, H., Murthy, G. V. S., Oye, J., & Polack, S. (2016, October 14). Measuring disability in population based surveys: The interrelationship between clinical impairments and reported functional limitations in Cameroon and India. *PLoS One* [Internet], 11(10), 1–18. Retrieved May 12, 2020, from <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0164470>
- Magnusson, L., Ahlström, G., Ramstrand, N., & Fransson, E. I. (2013). Malawian prosthetic and orthotic users' mobility and satisfaction with their lower limb assistive device. *Journal of Rehabilitation Medicine : Official Journal of the UEMS European Board of Physical and Rehabilitation Medicine* [Internet], 45(4), 385–391. Retrieved July 16, 2020, from <https://www.medicaljournals.se/jrm/content/abstract/10.2340/16501977-1117>
- Marie Knowlton, L., Gosney, J. E., Chackungal, S., Altschuler, E., Black, L., Burkle Jr, F. M., Casey, K., Crandell, D., Demey, D., Di Giacomo, L., Dohman, L., Goldstein, J., Gosselin, R., Ikeda, K., Le Roy, A., Linden, A., Mullaly, C. M., Nickerson, J., O'Connell, C., Redmond, A. D., & McQueen, K. (2012, March 20). Consensus statements regarding the multidisciplinary care of limb amputation patients in disasters or humanitarian emergencies: Report of the 2011 humanitarian action summit surgical working group on amputations following disasters or conflict. *Prehospital and Disaster Medicine* [Internet], 26(6), 438–448. Retrieved April 27, 2020, from <https://www.cambridge.org/core/journals/prehospital-and-disaster-medicine/article/consensus-statements-regarding-the-multidisciplinary-care-of-limb-amputation-patients-in-disasters-or-humanitarian-emergencies-report-of-the-2011-humanitarian-action-summit>
- Miles, S., & Singal, N. (2010). The education for all and inclusive education debate: Conflict, contradiction or opportunity? *International Journal of Inclusive Education* [Internet], 14(1), 1–15. Retrieved April 27, 2020, from https://www.tandfonline.com/doi/abs/10.1080/13603110802265125?casa_token=jXiwhL-QE-YAAAAA:UfNGfTnHk pY316acpI1r2L84RumgdrLD_gXyRmfHUNDQJBAaziu4Ioi1F_tSuOTdnD_AfFb7zKHM
- Mills, J.-A., Gosney, J., Stephenson, F., Skelton, P., Norton, I., Scherrer, V., Jacquemin, G., & Rau, B. (2018, July 9). Development and Implementation of the World Health Organization emergency medical teams: Minimum technical standards and recommendations for rehabilitation. *PLoS Currents* [Internet], 10, 1–8. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6050053/>
- Mirza, M. (2015). Disability-inclusive healthcare in humanitarian camps: Pushing the boundaries of disability studies and global health. *Disability in the Global South* [Internet], 2(1), 479–500. Retrieved April 28, 2020, from <https://dgsjournal.org/volume-2-number-1/>
- Mousavi, G., Ardalan, A., Khankeh, H., Kamali, M., & Ostadtaghizadeh, A. (2019, May 14). Physical rehabilitation services in disasters and emergencies: A systematic review. *Iranian Journal of Public Health* [Internet], 48(5), 808–815. Retrieved May 1, 2020, from <https://ijph.tums.ac.ir/index.php/ijph/article/view/17106>
- Mousavi, G., Khorasani-Zavareh, D., Ardalan, A., Khankeh, H., Ostadtaghizadeh, A., Kamali, M., & Raisi, G. (2019, January). Continuous post-disaster physical rehabilitation: A qualitative study on barriers and opportunities in Iran. *Journal of Injury & Violence Research* [Internet], 11(1), 35–44. Retrieved May 26, 2020, from <https://search-proquest-com.libproxy.ucl.ac.uk/docview/2251694048/fulltextPDF/AEA38D856CDF4456PQ/1?accountid=14511>
- Nagai, M., Abraham, S., Okamoto, M., Kita, E., & Aoyama, A. (2007, September 1). Reconstruction of health service systems in the post-conflict Northern Province in Sri Lanka. *Health Policy* [Internet], 83(1), 84–93. Retrieved April 27, 2020, from <https://www.sciencedirect.com/science/article/abs/pii/S0168851006002880?via%3Dihub>
- Ogunkeyede, S. A., Adebola, S. O., Salman, A., & Lasisi, A. O. (2017, March 1). Childhood hearing loss; a need for primary health care. *International Journal of Pediatric Otorhinolaryngology* [Internet], 94, 117–120. Retrieved May 12, 2020, from <https://www.sciencedirect.com/science/article/pii/S0165587617300149>
- Patil, A. K. V. (2015, July) SNAPSHOT: Nepal earthquake-experiences & observations of a Nepalese PT - SUNIL POKHREL. *Physiotimes* [Internet]. Retrieved May 27, 2020, from <https://www.physiotimes.com/article/snapshot-nepal-earthquake-experiences-observations-of-a-nepalese-pt-sunil-pokhrel/>
- Physiotherapy, N. (2015, April). *Association (NEPTA). The significant shift in Nepal's rehabilitation sector after the recent earthquake: A report on Nepal earthquake and rehabilitation responses* [Internet]. Nepal Physiotherapy Association (NEPTA). <http://nepalphysio.org.np/wp-content/uploads/2015/10/NEPTA-report-on-Nepal-Earthquake.pdf>
- Pryor, W., Nguyen, L., Islam, Q. N., Jalal, F. A., & Marella, M. (2018, December 18). Unmet needs and use of assistive products in two districts of Bangladesh: Findings from a household survey. *International Journal of Environmental Research and Public Health* [Internet], 15(12), 1–13. Retrieved April 28, 2020, from <https://www.mdpi.com/1660-4601/15/12/2901>
- Rauch, A., Baumberger, M., Moise, F.-G., von Elm, E., & Reinhardt, J. D. (2011, November). Rehabilitation needs assessment in persons with spinal cord injury following the 2010 earth quake in Haiti: A pilot study using an ICF-based tool. *Journal of Rehabilitation Medicine : Official Journal of the UEMS European Board of Physical and Rehabilitation Medicine* [Internet], 43(11), 969–975. Retrieved July 19, 2020, from <https://www.medicaljournals.se/jrm/content/abstract/10.2340/16501977-0896>
- Redmond, A. D., Mardel, S., Taithe, B., Calvot, T., Gosney, J., Duttine, A., & Girois, S. (2011, December). A qualitative and quantitative study of the surgical and rehabilitation response to the earthquake in Haiti, January 2010. *Prehospital and Disaster Medicine* [Internet], 26(6), 449–456. Retrieved May 29, 2020, from <https://search-proquest-com.libproxy.ucl.ac.uk/docview/1010625233/fulltextPDF/77ECEDF4DA34AF4PQ/1?accountid=14511>
- Reinhardt, J. D., Li, J., Gosney, J., Rathore, F. A., Haig, A. J., Marx, M., & Delisa, J. A. (2011, August 26). Disability and health-related rehabilitation in international disaster relief. *Global Health Action* [Internet], 4(1), 1–9. Retrieved April 27, 2020, from <https://www.tandfonline.com/doi/full/10.3402/gha.v4i0.7191>
- Rios, A., Cruz, A. M., Guarín, M. R., & Caycedo Villarraga, P. S. (2014, July 9). What factors are associated with the provision of assistive technologies: The Bogotá D.C. case. *Disability and Rehabilitation. Assistive Technology* [Internet], 9(5), 432–444. Retrieved April 6, 2020, from <https://www.tandfonline.com/doi/abs/10.3109/17483107.2014.936053?journalCode=iidt20>
- Rohwerder, B. (2018, March). *Assistive technologies in developing countries* [Internet]. K4D Helpdesk Report. UK Department for International Development. Retrieved April 28, 2020, from https://assets.publishing.service.gov.uk/media/5af976ab40f0b622d4e9810f/Assistive_technologies_in_developing_countries.pdf
- Ronoh, S., Gaillard, J. C., & Marlowe, J. (2015, March 5). Children with disabilities and disaster risk reduction: A review. *International Journal of Disaster Risk Science* [Internet], 6(1), 38–48. Retrieved April 28, 2020, from <https://link.springer.com/article/10.1007/s13753-015-0042-9>

- Sharma, A. (2015). Perspectives on inclusive education with reference to United Nations. *Universal Journal of Educational Research* [Internet], 3(5), 317–321. Retrieved April 6, 2020, from http://www.hrpub.org/journals/article_info.php?aid=2576
- Sheikhbardsiri, H. (2017). Rehabilitation of vulnerable groups in emergencies and disasters: A systematic review. *World Journal of Emergency Medicine* [Internet], 8(4), 253–263. Retrieved April 27, 2020, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5675965/>
- Sheppard, P. S., & Landry, M. D. (2016, April 23). Lessons from the 2015 earthquake(s) in Nepal: Implication for rehabilitation. *Disability and Rehabilitation* [Internet], 38(9), 910–913. Retrieved July 18 2020, from <https://www.tandfonline.com/doi/abs/10.3109/09638288.2015.1064482?journalCode=idre20>
- Stough, L. M., & Kang, D. (2015, June 13). The Sendai framework for disaster risk reduction and persons with disabilities. *International Journal of Disaster Risk Reduction* [Internet], 6(2), 140–149. Retrieved May 13, 2020, from <https://link.springer.com/article/10.1007/s13753-015-0051-8>
- Sumner, E., O'Connell, C., & MacAlpine, B. (2017, January 18). Wheelchair donation in a low-resources setting: Utilization, challenges and benefits of wheelchairs provided through a specialized seating programme in Haiti. *Journal of Rehabilitation Medicine : Official Journal of the UEMS European Board of Physical and Rehabilitation Medicine* [Internet], 49(2), 178–184. Retrieved April 6, 2020, from <http://www.medicaljournals.se/jrm/content/?doi=10.2340/16501977-2186>
- Tanabe, M., Nagujjah, Y., Rimal, N., Bukania, F., & Krause, S. (2015, December 1). Intersecting sexual and reproductive health and disability in humanitarian settings: Risks, needs, and capacities of refugees with disabilities in Kenya, Nepal, and Uganda. *Sexuality and Disability* [Internet], 33(4), 411–427. Retrieved April 27, 2020, from <https://link.springer.com/article/10.1007/s11195-015-9419-3>
- Tataryn, M., & Blanchet, K. (2012). *Giving with one hand . . . Evaluation of post-earthquake physical rehabilitation response in Haiti, 2010-a systems analysis* [Internet]. The London School of Hygiene & Tropical Medicine (LSHTM). Retrieved May 22, 2020, from www.cbm.org/http://disabilitycentre.lshtm.ac.uk
- The Sphere Handbook*. (2018) Sphere [Internet]. Retrieved November 11, 2020, from <https://spherestandards.org/handbook-2018/>
- Tilahun, D., Hanlon, C., Fekadu, A., Tekola, B., Baheretibeb, Y., & Hoekstra, R. A. (2016, April 27). Stigma, explanatory models and unmet needs of caregivers of children with developmental disorders in a low-income African country: A cross-sectional facility-based survey. *BMC Health Services Research* [Internet], 16(152), 1–12. Retrieved May 12, 2020, from <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-016-1383-9>
- Trani, J.-F., & Bakhshi, P. (2009). *Lack of a will or of a way? Taking a capability approach for analysing disability policy shortcomings and ensuring programme impact in Afghanistan* [Internet]. Brown School Faculty Publications. Retrieved October 15, 2020, from <http://www.ucl.ac.uk/lc-ccr/centrepublishations/workingpapers>
- Trudeau, M. O., & Rothstein, D. H. (2016, February). Injuries and surgical needs of children in conflict and disaster: From Boston to Haiti and beyond. *Seminars in Pediatric Surgery* [Internet], 25(1), 23–31. Retrieved May 5, 2020, from <https://doi.org/10.1053/j.sempedsurg.2015.09.006>
- UNHCR. (2011). *WASH in health care facilities in emergencies* [Internet]. World Health Organisation. Retrieved November 13, 2020, from <https://wash.unhcr.org/download/wash-in-health-care-facilities-in-emergencies-who/>
- UNICEF. *Latrine Add-On, child & disabled people - UNICEF supply catalogue* [Internet]. UNICEF Supply Catalogue, UNICEF. Retrieved November 13, 2020, from <https://supply.unicef.org/s0005848.html>
- UNICEF. (2017, May). *Including children with disabilities in humanitarian action* [Internet]. UNICEF. Retrieved June 10, 2020, from <https://sites.unicef.org/disability/emergencies/index.html>
- United Nations (2006). Convention on the Rights of Persons with Disabilities. *United Nations Enable* [Internet]. Retrieved November 3, 2020, from <https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html>
- United Nations Development Programme. (2014, August). *Barriers and opportunities at the base of the pyramid: The role of the private sector in inclusive development* [Internet]. UNDP. Retrieved May 11, 2020, from http://www.undp.org/content/dam/undp/library/Poverty%20Reduction/Private%20Sector/undp-psd-barriers_and_opportunities_BOP_Overview_Web.pdf
- Van Niekerk, K., Dada, S., & Tönsing, K. (2019, April 10). Influences on selection of assistive technology for young children in South Africa: Perspectives from rehabilitation professionals. *Disability and Rehabilitation* [Internet], 41(8), 912–925. Retrieved April 27, 2020, from <https://www.tandfonline.com/doi/abs/10.1080/09638288.2017.1416500>
- Visagie, S. J., Matter, R., Kayange, G. M., Chiwaula, M., Harniss, M., Mji, G., & Scheffler, E. (2018, March). Lessons from the pilot of a mobile application to map assistive technology suppliers in Africa. *African Journal of Disability* [Internet], 7, 1–4. <https://ajod.org/index.php/ajod/article/view/422>
- Walsh, E. S., Peterson, J. J., & Judkins, D. Z. (2014). Searching for disability in electronic databases of published literature. *Disability and Health Journal*, 7(1), 114–118. <https://doi.org/10.1016/j.dhjo.2013.10.005>
- Washington Group on Disability Statistics. (2014). *WG Short Set on Functioning (WG-SS) - The Washington Group* [Internet]. Retrieved November 4, 2020, from <https://www.washingtongroup-disability.com/question-sets/wg-short-set-on-functioning-wg-ss/>
- Weerasinghe, I. E., Fonseka, P., Dharmaratne, S. D., Jayatilake, J. A. M. S., & Gielen, A. C. (2015, May 9). Barriers in using assistive devices among a group of community-dwelling persons with lower limb disabilities in Sri Lanka. *Disability, CBR and Inclusive Development* [Internet], 26(1), 79–96. Retrieved May 22, 2020, from <http://dcidj.org/article/view/410>
- WHO. (2013). *Assistive technology fact sheet* [Internet]. World Health Organisation. Retrieved November 13, 2020, from <https://www.who.int/news-room/fact-sheets/detail/assistive-technology>
- Wolbring, G. (2011). Disability, displacement and public health: A vision for Haiti. *Canadian Journal of Public Health* [Internet], 102(2), 157–159. <https://link.springer.com/article/10.1007/BF03404167>
- World Confederation for Physical Therapy. (2016, March). *The role of physical therapists in disaster management* [Internet]. WCPT report. Retrieved May 18, 2020, from https://www.wcpt.org/sites/wcpt.org/files/files/resources/reports/WCPT_DisasterManagementReport_FINAL_March2016.pdf
- World Health Organisation. (2021). *Policy brief: Access to assistive technology* [Internet]. Retrieved November 9, 2020, from <https://www.who.int/publications/i/item/978-92-4-000504-4>
- World Health Organization. (2011). *World Report on Disability* [Internet]. World Health Organisation. Retrieved April 30, 2020, from https://www.who.int/disabilities/world_report/2011/report/en/
- World Health Organization. (2014). *The Lao People's Democratic Republic health system review* [Internet]. Tangcharoensathien V, Patcharanarumol W, editors. WHO Regional Office for the Western Pacific. (Health System in Transition; Vol.4 No.1). Retrieved June 2, 2020, from https://iris.wpro.who.int/bitstream/handle/10665.1/10448/9789290616481_eng.pdf
- World Health Organization. (2016). *Emergency medical teams: Minimum technical standards and recommendations for rehabilitation* [Internet]. Retrieved November 3, 2020, from <https://www.who.int/publications/i/item/emergency-medical-teams>
- World Health Organization. (2010). *Community-based rehabilitation: CBR guidelines* [Internet]. Retrieved November 4, 2020, from <https://www.who.int/publications/i/item/9789241548052>
- Zhang, L., Liu, X., Li, Y., Liu, Y., Liu, Z., Lin, J., Shen, J., Tang, X., Zhang, Y., & Liang, W. (2012, March 3). Emergency medical rescue efforts after a major earthquake: Lessons from the 2008 Wenchuan earthquake. *The Lancet* [Internet], 379(9818), 853–861. Retrieved July 17, 2020, from [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(11\)61876-X/ppt](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(11)61876-X/ppt)
- Zhang, X., Reinhardt, J. D., Gosney, J. E., & Li, J. (2013, January 15). The NHV rehabilitation services program improves long-term physical functioning in survivors of the 2008 Sichuan earthquake: A longitudinal Quasi experiment. *PLoS One* [Internet], 8(1), 1–10. Retrieved May 22, 2020, from <https://journals.plos.org/plosone/>