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To cite this article: Natasha Layton, Alice Spann, Mehedi Khan, Silvana Contepomi, Evert Jan Hoogerwerf, Diane Bell & Luc de Witte (12 Mar 2024): Guidelines for assistive technology service provision – A scoping review, Disability and Rehabilitation: Assistive Technology, DOI: [10.1080/17483107.2024.2327515](https://doi.org/10.1080/17483107.2024.2327515)

To link to this article: <https://doi.org/10.1080/17483107.2024.2327515>



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Published online: 12 Mar 2024.



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RESEARCH ARTICLE



Guidelines for assistive technology service provision – A scoping review

Natasha Layton^{a,b} , Alice Spann^c , Mehedi Khan^d , Silvana Contepomi^{b,e} , Evert Jan Hoogerwerf^b ,
Diane Bell^{f,g,h}  and Luc de Witte^{e,i} 

^aRAIL Research Centre, Monash University, Frankston, Australia; ^bGAATO, Geneva, Switzerland; ^cNursing Academy Order of Merciful Brothers, Vienna, Austria; ^dKobe Gakuin University, Kobe, Japan; ^eATAA, Buenos Aires, Argentina; ^fGlobal Disability Innovation Hub, London, UK; ^gUCL Interaction Centre, University College London (UCL), London, UK; ^hBusiness School, Stellenbosch University, Bellville, South Africa; ⁱThe Hague University of Applied Sciences, Hague, The Netherlands

ABSTRACT

Purpose: Despite the high unmet need for effective AT provision, multiple service delivery models across different countries, and a shortage of personnel trained in this field, no widely useable and accepted Assistive Technology (AT) service provision guidelines currently exist. This review aims to provide an overview of the literature regarding AT service provision guidelines to inform the development of globally useable AT provision guidance, aligned with contemporary global initiatives to improve access to AT.

Materials and Methods: The rapid scoping review method used a two-tiered approach to identifying relevant publications: (1) systematic search of academic databases (Medline, CINAHL, SCOPUS, and Google Scholar); (2) consultation with international AT organisations and experts. The search was conducted in March 2023 with no date limitations. Analysis was guided by the TIDE-funded HEART research on quality AT provision and service delivery processes in Europe, as well as the WHO-GATE 5P framework for strengthening access to AT.

Results: 35 publications were identified from various countries, and directed at differing assistive products, personnel, and provision contexts. No established guidelines for AT service provision currently exist. However, despite the variety in contexts, the range of assistive products and the range of stakeholders to whom guidelines are directed, several key service delivery steps were identified that may form part of such guidelines.

Conclusions: This review offers a strong starting point for developing guidance for AT provision to meet global needs. Careful consideration of vocabulary, process, and application to the diversity of assistive products is recommended in systematizing globally applicable guidance.

ARTICLE HISTORY

Received 22 August 2023
Accepted 26 February 2024

KEYWORDS

Assistive technology; service provision; quality; guidelines; scoping review

► IMPLICATIONS FOR REHABILITATION

- Guidelines offer accepted benchmarks for clinical practice.
- Evidence-based guidelines ensure consistent and appropriate interventions, including assistive technology provision.
- The evidence suggests global guidance is required, and a substantial evidence base can be drawn upon to formulate such guidelines.

Introduction

Guidelines are sets of information that suggest how something should be done¹. Usually produced by official organisations to certain methodological standards, guidelines become a known and trusted source of practice support. The World Health Organization (WHO) for example lists 239 guidelines or recommendations for clinical practice, formulated according to a standardised guideline development process [1].

Assistive Technology (AT) refers to both assistive products (AP) and the services or actions necessary for the safe and effective provision of APs to people who need them [2]. International standards and product specifications exist for APs, see for example the AP classification and terminology standard [3] and AP specifications [4]. AT journals contain a growing body of expert opinions and consensus statements regarding AT provision and service

delivery. A substantial body of evidence demonstrates the critical role of AT provision and is championed in both the World Health Assembly Resolution 71.8 on improving access to AT [5] and the subsequent WHO/UNICEF Global Report on AT [6] which asks: why is there no widely useable and accepted guideline to support “service delivery or provision of APs and related services” as yet?

There are a number of likely reasons. Across the available literature, the focus on various process elements or quality indicators differs, as does exactly which type of AP is being discussed, and the nature of the target audience. Additionally, different terms and vocabularies are used across contexts and stakeholder groups. For example, the term AT provision is typically used by policymakers regarding moral and legal obligations to provide AT to persons with disabilities, including the financial aspects. AT service provision or service delivery is commonly used by professionals about services that have to be in place and how these should be delivered.

CONTACT Natasha Layton  Natasha.Layton@monash.edu  RAIL Research Centre, Monash University, Frankston, Australia

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Conceptualising service provision and service delivery

The WHO conceptualises provision as one of five broad principles within the AT ecosystem which includes the infrastructure, systems, and processes needed to deliver the service. The WHO Policy Brief states that the provision “includes the following key steps: assessment and fitting, user training and follow-up, repairs, and maintenance; and that feedback from service users is an integral component” [2, p.7].

A consortium of AT experts led by Andrich describes an AT service delivery process “through which an individual goes to obtain an AT solution that meets (their) needs and fits within the context in which it will be used” [7, p.263]. Concurring with the WHO vision of provision as a broader context, Andrich et al. state, “The service delivery process is embedded in a service delivery system, involving a whole set of legislation and policy, professionals and organisations.... This creates a very diverse landscape of AT service delivery systems and processes” [7, p.263].

This scoping review focused on the process whereby a person needing AT becomes a safe and effective user of AT. That is service delivery elements or steps. Service delivery occurs within service delivery infrastructures and the broader provision contexts that enable service delivery to occur.

Considering processes and steps

The first systematic, multi-country study of AT provision and service delivery (the HEART study) occurred across 16 European countries in 1994 and identified seven essential service delivery steps that form a process through which an AT user goes, and is delivered by AT services [8]. Critical reviews of these steps and their use in national position papers over subsequent decades demonstrate their ongoing relevance [9–14].

A 2019 position paper on AT provision emerging from the WHO GReAT Summit reiterated the importance of all seven steps to achieve functional outcomes with APs, yet noted service delivery steps are not consistently used in practice [15]. For example, WHO publications describe AT service provision steps ranging in number from eight steps in relation to wheelchair provision [16] to four steps in relation to training in APs [17] and prosthetics and orthotics provision [18]. Nevertheless, our premise is that core elements are universally applicable, as discussed within the Global GReAT Consultation [19]. Recent global consensus-building research also suggests that, given the huge need for AT, the variety of service delivery models across different countries, and the shortage of personnel trained in this field, it is important to develop globally useable guidance [20].

This paper therefore aims to identify and synthesise globally existing evidence on AT provision guidelines, thereby contributing to the development process of WHO Guidelines on the provision of AT.

Methods

This review utilises a rapid scoping review approach. A scoping review allows the synthesis of systematically gathered material from diverse sources, including academic and grey literature. The aim is to obtain a comprehensive overview of the evidence base regarding a specific topic, to identify any research gaps, and to inform policy, practice, and future research. The following six steps are recommended when conducting a scoping review: (1) identifying the research question; (2) identifying relevant publications; (3) selecting the publications; (4) charting the data; (5) organizing, summarizing,

and reporting the findings; and (6) an optional stakeholder consultation to confirm the soundness of the findings [21,22].

Identifying the research question

The overall aim of this review is to contribute to the development process of WHO guidelines on the provision of AT. As such, this review aims to identify and synthesise globally existing evidence on AT service provision guidelines. The following research questions are addressed:

- What guidelines exist for AT service provision?
- What do authors in this field see as key elements of such guidelines?

Identifying relevant publications

This rapid scoping review used a two-tiered approach to identifying relevant publications: (1) a systematic search of academic databases; (2) consultation with AT experts and organisations.

Tier 1: Systematic search of academic databases, identifying and selecting relevant publications

The systematic literature search was conducted in four academic databases: MEDLINE (focus on medicine), CINAHL (focus on nursing and allied health professions), SCOPUS, and Google Scholar (both multidisciplinary). After discussion within the research team, these databases were selected due to their accessibility, and thematic and disciplinary relevance. All databases index international publications and while English is the most prominent language by far, there are no discernible limitations in any of these databases regarding the language of indexed publications. At the start of the review, the research question was operationalised using the ECLIPSE tool designed to prepare search strategies for health management topics. The acronym stands for **E**xpectation, **C**lient group, **L**ocation, **I**mpact, **P**rofessionals, and **S**ervice [23]. In the end, only the **E** and **SE** concepts were used to construct the search strategy. The **L** concept was omitted entirely as it was not deemed relevant. However, eligibility criteria were developed for each remaining concept to define the scope of the search and guide the title and abstract screening later on. [Table 1](#) presents the operationalised concepts using ECLIPSE, as well as the in- and exclusion criteria.

Using the E and SE concepts, four different search strategies were constructed and trialed in the CINAHL database. The search strategy the research team agreed on consisted of the following basic search string: “assistive technology AND service provision AND guidelines”. An additional search concept representing “quality” was also trialed in combination with the search string but reduced the yield dramatically. Therefore “quality” was not used as a search concept or a selection criterion so as not to risk missing relevant publications. Search terms representing the “service provision” concept were identified based on the seven steps from the HEART study [9]. Search terms referring to various APs (based on the WHO Priority Assistive Products List; [24]) were used within the trial searches but ultimately yielded an unfeasible number of publications. The final search strategy thus represents a compromise of being as comprehensive as possible while still being feasible in the available timeframe. No limitations were defined regarding the time of publication, language, or publication format. The final search string (see [Appendix A1](#)) was initially used in the CINAHL database and then adapted for the remaining databases.

Table 1. Search concepts using ECLIPSE (Wildridge & Bell [23]) and in-/exclusion criteria.

ECLIPSE Elements	Included	Excluded
Expectation (what does the search requester want the information for)	Development of quality guidelines for AT service provision (i.e., documents or lists detailing requirements to ensure that services are fit for purpose)	- Publications not referring to quality guidelines of AT service provision - Publications only making the case why AT service provision guidelines are needed - Publications applying/ testing/ evaluating existing guidelines
Client group (at whom is the service aimed)	People of all ages who require AT to manage or compensate for a functional impairment or a physical or learning disability or illness or frailty	People not needing/using AT
Impact (what is the change in the service, if any, which is being looked for? What would constitute success? How is this being measured?)	Successful (long-term, safe) AP adoption by end-user. Other means of describing success may be defined. This information will be processed.	Not defined
Professionals (who is involved in providing/ improving the service)	AT personnel / practitioners, community-based rehabilitation workers, technicians, etc.	Not defined
Service (for which service are you looking for information?)	AT service provision, i.e., the process whereby a person needing AT becomes a safe and effective user of AT; including (but not limited to) the following steps²: - Initiative (first contact with service delivery team) - Assessment (evaluation of needs) - Selection of the assistive solution (defining the individual AT programme) - Selection of the equipment (choosing the specific equipment within the AT programme) - Authorisation (obtaining funding) - Implementation (delivering the equipment to the user, fitting and training) - Management and follow up (maintenance and periodic verification)	Focus on APs not on service delivery (e.g., research & development or use-case or evaluation of specific products) Any technology not considered AT (e.g., technology for diagnosis and/or treatment of diseases)

Search results were subsequently uploaded into EndNote reference management software [25] and duplicates were removed *via* the software and a manual screening. Titles and abstracts of the remaining publications were then exported to Microsoft Excel [26] (titles alphabetically ordered) and screened for eligibility by NL, SC, and MK. The screening of titles and abstracts was divided amongst the three reviewers. To ensure that reviewers applied the eligibility criteria consistently, a random section of this Excel sheet, comprising of 300 publications, was screened independently by all three reviewers. Sources were deemed to qualify for inclusion if they contained systematic elements of guidance for service provision. There was disagreement in only 4% of the 300 publications, indicating a very high degree of agreement. Thus, independent screening could commence. Any remaining uncertainty was resolved through discussion. The main reasons for excluding publications were: (1) not a guideline; (2) guideline, but for AT research and development; (3) application of a known guideline; (4) argues why AT provision guidelines are needed, and (5) guidelines for training personnel.

Tier 2: Consultation with AT experts and organisations

Relevant publications to answer the research question are not exclusively found in academic databases indexing primarily peer-reviewed journal articles. Other relevant sources include e.g., reports from government or non-government organisations on a local, national, regional or global scale. Such grey literature sources can be included in the synthesis when following a scoping review approach. An open call was made to members of the WHO Global Cooperation on Assistive Technology (GATE) network [27] and to members and associate members of the Global Alliance of Assistive Technology Organizations (GAATO) [28]. In addition, the call was individually sent to 24 global bodies *via* the Global Disability Innovation (GDI) Hub [29]. The experts in the field of AT service provision were thus asked to forward any publications they had access to that were relevant to the research question. In total, 39 publications (including reports and websites) were received from 21 different organisations and individuals. Three of those proposed

publications could not be retrieved. After applying the eligibility criteria defined for the systematic database search (see Table 1) and removing duplicates already located through the Tier 1 search, 18 publications remained for analysis from this tier based on the inclusion/exclusion criteria outlined above. The complete search process is depicted in the flow chart in Figure 1.

Charting the data

One paper only was sourced in a language other than English. This paper was translated from Japanese to English by the key informant who provided it (Tier 2 publication no 23). Relevant information was extracted from the included publications using a data extraction framework divided into the following sections: (A) a general description of publications (year of publication; authors/authoring organization; type of publication; study design; language; quality indicators i.e., endorsement or peer-review); (B) AT/AP discussed; (C) guideline descriptive information (purpose; target group(s); global, national or regional applicability; measurement of success); (D) six categories of priority APs (mobility; self-care; vision; hearing; communication; cognition) (23) and (E) service delivery steps mentioned.

Organizing, summarizing, and reporting the findings

The results obtained from the charted data through the data extraction framework are structured according to publication date, method and type of publication, reach of the publication (global, regional, national, local), AP type, and audience.

Results

Description of the included publications

The Tier 1 search in the four databases resulted in a total of 11,503 publications. After the removal of duplicates, the titles and

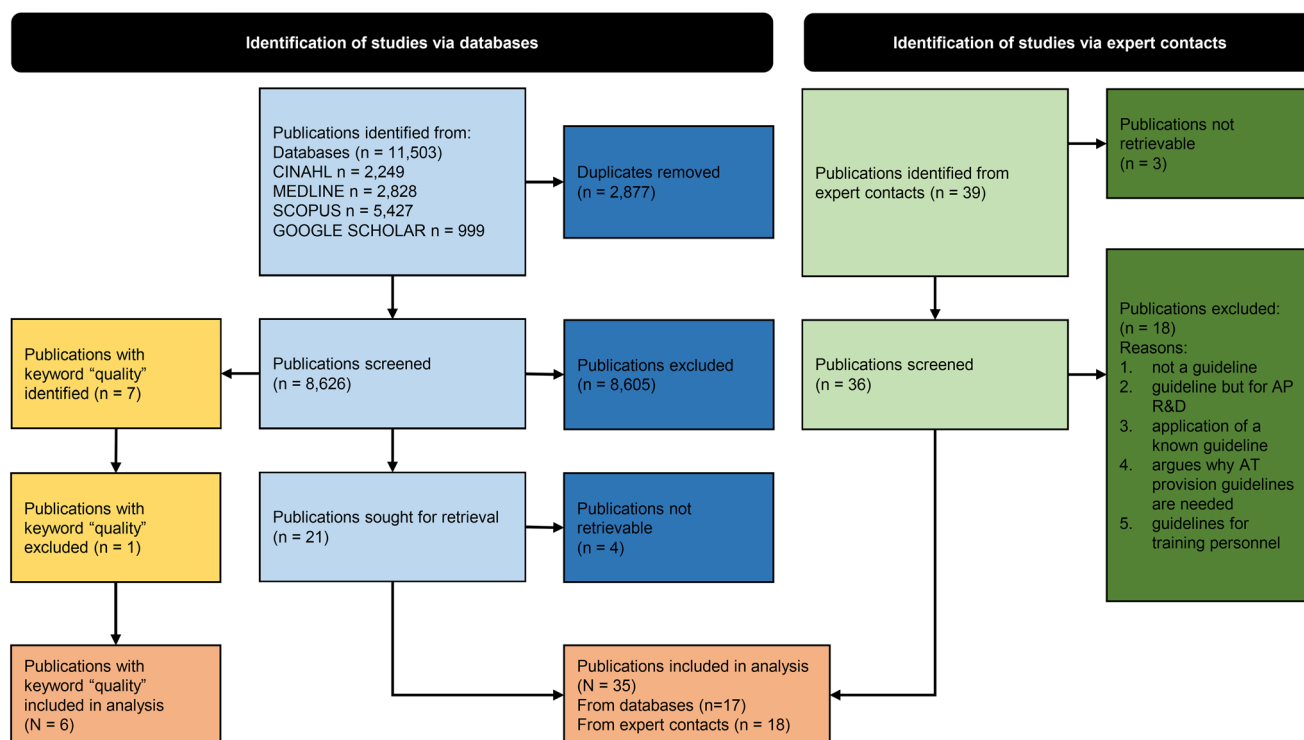


Figure 1. Flow chart of the Tier 1 (database search) & Tier 2 (expert contacts) search process.

abstracts of 8626 publications were screened, resulting in the identification of 21 publications that fit the eligibility criteria. Four of those were excluded as their full texts were not accessible, leaving 17 database-sourced publications to be included in the analysis. The Tier 2 expert consultation resulted in a further 18 publications (see Table 2 for an overview of the included publications). This totaled a yield of 35. The HEART steps (quality AT provision and service delivery processes in Europe) [9] as well as the WHO-GATE 5P framework for strengthening access to AT [6], were used as analytic frameworks.

Many publications described themselves as “guidelines”, “guides”, or “standards” but were varied in format and design. Publications were therefore categorised according to format rather than claim, with the majority being journal articles (40%) or reports (40%), with 8% book chapters and 6% respectively conference proceedings and position papers. Study designs varied, with 20% explicitly mentioning a systematic guideline development approach, 3% using review methodologies, a further 20% comprised qualitative studies, and 40% consisting of commentaries. 17% could not be classified.

No date range was applied within the search strategy, and publication dates on this topic were found to span 40 years, from 1982 until 2022. Two publications were updated reports; in these cases, the most recent publication date was counted. The majority ($n=29$) of the included publications have been published after 2010. We sought information as to the (self-defined) global, national, or regional applicability of the publications. This was either indicated in the title (e.g., “international guideline”), deduced from the scope (e.g., pertaining to one country or a region such as Europe), or inferred from the country and institution of origin of the authors. Figure 2 demonstrates that the majority of guidelines were national in focus.

Guidelines covering specific AT and applicable to global regions were published by the WHO and include standards for prosthetics and orthotics [18] and the provision of manual wheelchairs in

less-resourced settings [16]. While not identifying as a guideline, WHO and UNICEF published a global snapshot of AT with associated recommendations in 2022 [6], National guidelines addressed the policy context of the particular country and were located for Japan [30] South Africa [31], Australia [14] and Papua New Guinea [32]. Other publications provided commentaries upon AT service provision for nations such as Finland [33], the USA [34], Sweden [35], the Netherlands [36] and regions such as Europe [12,37]. Some commentaries address AT generally did not have specified geographic boundaries [7,38–41]. Others addressed a subset of AP with a national focus [42–44] or focussed on a geographic region and a subset of AP [45,46]. Some publications were authored by government bodies with national applicability [47–49]. Some guidance on focal AP’s was authored by national leadership bodies [50], or by individual researchers or author groups [51,52]. Finally, some publications addressed local needs such as guidelines for the provision of AT in educational contexts in certain US states [53–55] or represented commentaries linking constructs such as quality of life with service provision [56].

Fourteen publications mentioned all assistive product groups (mobility; self-care; vision; hearing; communication; cognition [24]), and 4 publications mentioned more than one group of AP (between 2 and 5). Most publications ($n=10$) addressed guidelines for mobility products. Vision and hearing products were the least mentioned ($n=1$ each). Six publications spoke about assistive products generally (see Figure 3).

Some authors also described functional categories such as education and vocation. The wide variation in approach, detail, and language appears to be related to the audience within the AT ecosystem. The five categories of the WHO-GATE 5P framework (people, products, personnel, policy, and providers) were used as target groups for data extraction (see Figure 4), noting AT stakeholders such as manufacturers/designers are not included because separate guidelines address product research and development. Further, the “other” category includes researchers.

Table 2. Overview of included publications.

Number	Reference	Type of publication	Design	Applicability	AT group(s) discussed	5 P Target group(s)	Service delivery steps mentioned (based on HEART steps)								
							Initiative	Assessment	Selection of solution	Selection of equipment	Authorisation	Implementation	Management & follow up	Additional steps	
TIER 1 PUBLICATIONS	[33]	Tuikka & Sachdeva (2017)	CP	C	national (FIN)	n/a	all 5 Ps	N	N	Y	N	Y	N	Y	Y
	[34]	Schoech et al. (1993)	JA	S (qual)	national (USA)	all AT	all 5 Ps	N	Y	N	Y	N	Y	Y	Y
	[36]	Heerkens et al. (2011)	JA	C	national (NLD)	all AT	people	N	Y	Y	N	N	Y	Y	Y
	[37]	Steel & de Witte (2011)	JA	C	regional (EU)	all AT	all 5 Ps	Y	Y	Y	Y	Y	Y	Y	Y
	[38]	Scherer (2019)	B	S (qual)	global	all AT	all 5 Ps	Y	Y	Y	Y	Y	Y	Y	Y
	[39]	Federici et al. (2014)	JA	C	global	all AT	people, personnel, providers	Y	Y	Y	Y	Y	Y	Y	Y
	[40]	Andrich (2022)	R	C	global	all AT	people, personnel, providers	N	N	Y	Y	N	Y	Y	N
	[41]	Shay et al. (2019)	B	n/a	global	n/a	personnel	Y	Y	Y	Y	Y	Y	Y	N
	[42]	Dietz et al. (2012)	JA	S (qual)	national (USA)	COM	people	N	Y	Y	N	N	N	Y	Y
	[43]	Dolan (2013)	JA	S (qual)	national (UK)	M	all 5 Ps	N	Y	N	N	Y	Y	Y	Y
	[44]	Barfati & Boman (2014)	JA	C	national (SWE)	COG	people, personnel	Y	Y	N	Y	N	Y	Y	N
	[46]	Wild (2013)	JA	C	national (USA)	COG	personnel	N	N	N	N	N	Y	Y	Y
	[51]	Delisa & Greenberg (1982)	JA	C	local (USA)	M	personnel, providers	N	N	Y	N	Y	N	N	Y
	[52]	Joddrell & Cudd (2015)	JA	S (qual)	global	COG	people	Y	N	Y	N	Y	Y	Y	Y
	[56]	Scherer (1996)	JA	C	global	COM, V, H	personnel, providers, policy & funding, other	N	N	N	N	N	N	N	Y
[57]	Zabala (2020)	B	S (qual)	global	n/a	people, personnel, providers	Y	Y	Y	N	N	Y	Y	Y	
[58]	Lenker et al. (2004)	JA	C	global	all AT	all 5 Ps	N	N	N	N	N	N	N	Y	

(Continued)

Table 2. Continued.

Number	Reference	Type of publication	Design	Applicability	AT group(s) discussed	5 P Target group(s)	Service delivery steps mentioned (based on HEART steps)								
							Initiative	Assessment	Selection of solution	Selection of equipment	Authorisation	Implement-tation	Management & follow up	Additional steps	
TIER 2 PUBLICATIONS															
[6]	WHO (2022)	R	C	global	all AT	all 5Ps	Y	N	Y	Y	N	Y	Y	N	N
[7]	Andrich et al. (2019)	CP	C	global	all AT	all 5Ps	Y	Y	Y	Y	Y	Y	Y	Y	Y
12	AAATE (2018)	PP	R	regional (EU)	all AT	all 5Ps	Y	Y	Y	Y	Y	Y	Y	Y	N
[14]	ARATA (2016)	PP	C	n/a	all AT	all 5Ps	Y	Y	Y	Y	Y	Y	Y	Y	Y
[16]	WHO (2008)	R	SGDP	regional (LMIC)	M	all 5Ps	Y	Y	N	Y	Y	Y	Y	Y	Y
[17]	WHO (2017)	R	SGDP	global	M	all 5Ps	N	Y	N	Y	N	Y	Y	N	N
[30] ^a	AT professional organisation Inoue, Fukusen (nd)	R	n/a	national (JPN)	all AT	personnel, policy & funding	N	Y	Y	Y	Y	Y	Y	N	N
[31]	Department of Health South Africa (2003)	R	n/a	national (SAF)	all AT	N/a	N	Y	N	Y	Y	Y	Y	Y	Y
[32]	Brentnall L, Mines K, McGrath K, et al.: Motivation Australia (2016)	R	SGDP	national (PNG)	V, H, M	all 5Ps	Y	Y	Y	N	Y	Y	Y	Y	Y
[35]	Dahlberg et al. (2014)	JA	C	national (SWE)	all AT	all 5Ps	Y	N	Y	N	N	Y	Y	Y	Y
[45]	Van Der Heide et al. (2017)	JA	S (qual)	national (NLD)	M	people, personnel	Y	Y	Y	Y	Y	Y	Y	Y	Y
47	Enable NSW & LifeTime Care and Support (LTCs) Australia (2011)	R	SGDP	national (AUS)	M	all 5Ps	Y	Y	N	Y	N	Y	Y	Y	Y
[48]	iCARE NSW & Lukersmith (2021)	R	SGDP	national (AUS)	M, SC	all 5Ps	Y	Y	Y	Y	Y	Y	Y	N	N
[49]	NSW Agency for Clinical Innovation, Australia (2014)	R	SGDP	national (AUS)	M, SC	all 5Ps	Y	Y	Y	Y	Y	Y	Y	Y	Y
[50]	RESNA (2011)	R	SGDP	national (USA)	M	all 5Ps	Y	Y	Y	N	Y	Y	Y	Y	Y
[53]	Connecticut State Department of Education (nD)	R	n/a	local (USA)	n/a	people, personnel	Y	Y	N	N	Y	N	Y	Y	Y
[54]	North Dakota Department of Public Instruction (2015)	R	n/a	local (USA)	n/a	people, personnel	N	Y	Y	Y	N	Y	Y	N	N
[55]	Michigan Region IV Assistive Technology Consortium (2021)	R	n/a	local (USA)	n/a	personnel	Y	Y	Y	Y	N	N	N	N	Y

^aPublication in Japanese, with translation provided by the informant.

• Y: YES, N: NO.

• Type of publication: B: Book (chapter); CP: Conference Proceedings; JA: Journal Article; R: Report; PP: Position Paper; Design: S: Study; C: Commentary; R: Review; SGDP: Systematic Guideline Development Process;.

• AT groups discussed: M: Mobility; SC: Self-Care; V: Vision; H: Hearing; COM: Communication; COG: Cognition.

Eighteen publications mention all 5 Ps, and 10 publications mention more than one P (between 2 and 4). Most publications were directed at personnel ($n=13$) and people, meaning AT users ($n=10$).

The target group influenced both the “process model” used to explain the AT service provision process, and the language used. Publications targeted at health and medical personnel described AT service delivery steps within prescription models for wheelchairs [51] and pressure care [49]. However, in their work on dynamic arm supports, Van Der Heide et al. both highlight the applicability of the HEART steps and offer contemporary “care-focused” language. They rephrase the 7 HEART steps into (1) identify a problem; (2) formulate a demand for care; (3) formulate a care plan; (4) selecting, trying, and deciding; (5) delivery; (6) use; (7) evaluation and follow-up assessment [45].

Regarding Augmentative and Alternative Communication products (AAC), the elements of (1) communication assessment using scenarios; (2) consideration of the need for alternative access; (3) incorporation of multiple modalities; (4) AAC instructions; (5) assessment of a variety of symbol system; and (6) device trials, are very similar to the HEART steps [9]. Likewise in cognition products for dementia, the steps of (1) meeting the client; (2)

goal setting; (3) assessment; (4) choice of relevant device; (5) teaching and training plan; and (6) follow-up, are recognizable [44].

Provision steps for educational technologies can be mapped to the HEART steps but use terminology such as consideration, transition, and inclusion (in an education plan). All education-related publications located [53–55] cited the work of Joy Zabala as informing both the process and quality of AT provision for education, specifically the Student, Environment, Tasks, Tools (SETT) Model [57] (35) and related Quality Indicators for Assistive Technologies (QIAT) [58]. Table 3 maps the HEART steps (column 1) and TAP steps (column 6) with sample terms from the functional areas of education and vocation, as well as the AP area of mobility.

Across the yield, AT provision step descriptors were described in different ways but broadly mapped to the foundational HEART study steps. Table 4 links the HEART steps with some of the synonyms located (column 2) and sub-steps or elements that were specified within the yield (column 3).

Two further observations can be made about the use and granularity (that is, the scale or level of detail) of the HEART steps. Some guidelines included extremely granular descriptions of service delivery steps. For example, regarding pressure care products, Step 7 Management and Follow-up includes differing decision trees regarding functional capacity and equipment steps depending upon whether the person is at risk of pressure injury; or has a pressure injury [49].

Several publications consider the broader ecosystem and suggest additional steps such as disseminating basic information about the needs for and benefits of using an AP, and using a screening tool to identify those who can benefit from available services [16].

There were several proposals to update the language of AT service provision as depicted in Table 4 (columns 4 and 5). Aligning with global principles of rehabilitation and functioning, authors from the Netherlands (2011) offer the following reprise of the 7 steps: (1) Identifying a problem in functioning; (2) Formulating the need; (3) Drawing up a care plan; (4) Selecting; (5) Supplying the AT and instructing its use; (6) Using the AT; (7) Evaluating the effects on functioning [36]. An updated vocabulary is proposed by Scherer in 2019: (1) Referral; (2) Intake and initial assessment (3) Systematic assessment; (4) Plan development; (5) Recommendations and report; (6) Technology procurement and development; (7) Implementation and training; (8) Follow-along and case termination; and (9) Follow-up and re-referral [38]. It is notable that authors from different parts of the world, despite

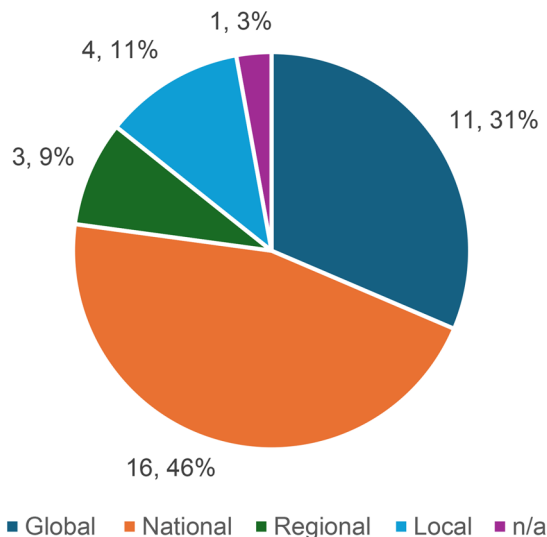


Figure 2. Geographical applicability of guidelines.

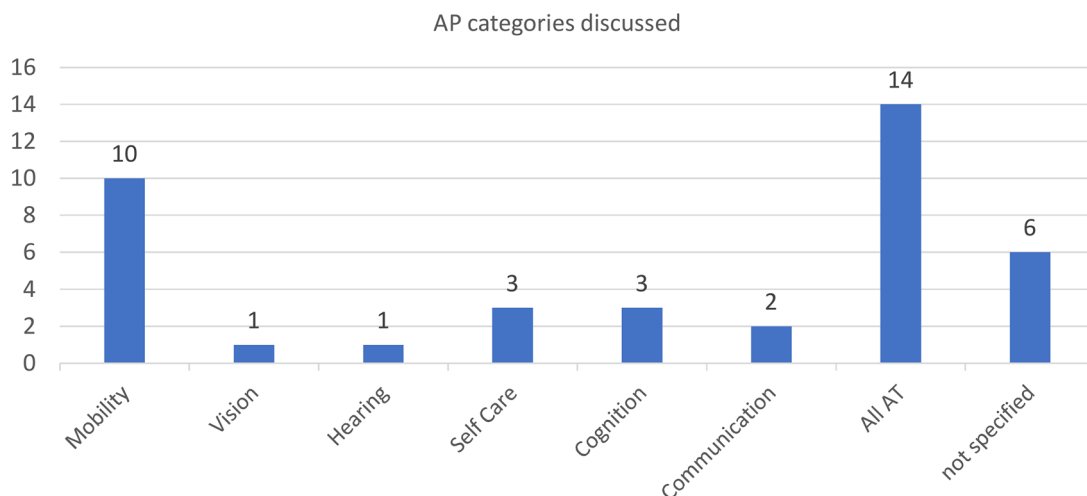


Figure 3. Coverage of assistive products.

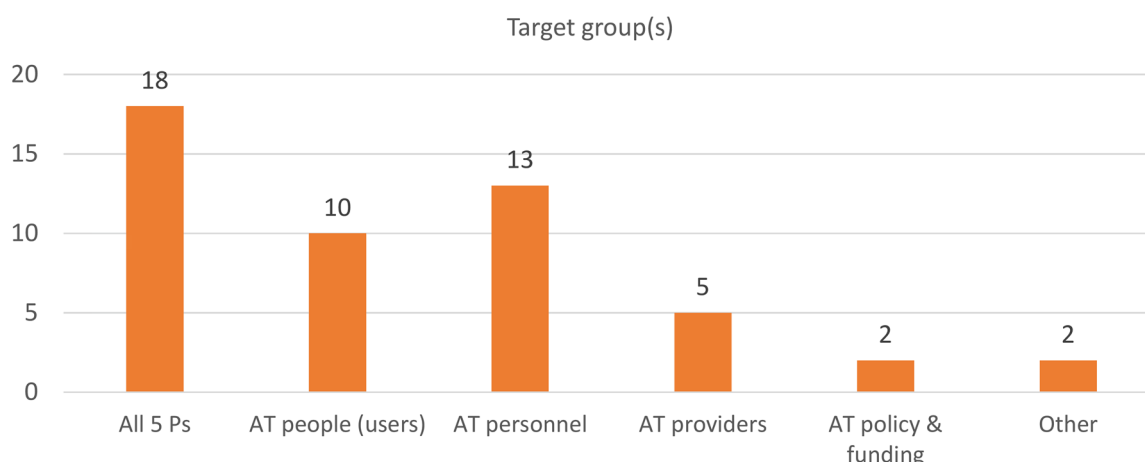


Figure 4. Target groups (NOTE product stakeholders such as developers excluded as separate guidelines applicable).

Table 3. AT Service delivery steps: education, vocation and prosthetics, wheelchairs and TAP compared with the HEART steps.

HEART steps (8)	AT for education	AT for work (58)	AT for mobility: prosthetics	AT for mobility: wheelchairs (15) (59)	TAP (training in assistive products) steps (60, 61)
Initiation	Consideration	Intake and initial assessment		1. Referral and appointment	Assessment
Assessment (evaluation of needs)	Assessment/evaluation	Systematic assessment	Assessment	2. Assessment	
Selection of the assistive solution (defining individual AT programme)	Problem identification	Plan development	Fabrication and fitting	3. Prescription (selection)	
Selection of equipment (choosing specific equipment within AT programme)	Conducting trials				
	Solution generation/solution selection	Recommendation and report	Trial of componentry over a number of weeks, in the real world, in collaboration with the multidisciplinary team. The trial and practice should include time: in the home, including undertaking activities of daily living, e.g., self-care and domestic tasks, performing activities relevant to the person's goals, at work (if applicable), performing relevant leisure activities (17)		
Authorisation (obtaining funding)		Technology procurement and development		4. Funding and ordering	Fitting User training
Implementation (delivering equipment to user, fitting and training)	Including assistive technology in the IEP (plan)	Implementation and training	User training	5. Product preparation 6. Fitting 7. User training	
Management and follow up (maintenance and periodic verification)	Evaluating the effectiveness of assistive technology use	Follow along and case termination Follow -up and referral	Product delivery and follow-up	8. Follow-up, maintenance and repairs	Follow-up

different context and languages, propose very similar steps and terminology.

Discussion

This rapid scoping review demonstrated conceptual alignment yet differences in terminology in the field of AT provision. The literature did not distinguish clearly between provision and

service delivery, and these terms were often used interchangeably. Despite the use of different terms, strong consensus was evident regarding key process steps for AT provision. There was a remarkable congruity of approach between health-based guidelines and education-based guidelines, suggesting a broad and non-medical approach to guideline development would be most suitable in addressing the array of APs which exist.

At the heart of AT provision lies the processes or steps by which an AT user obtains their AT and attains their goals. The

Table 4. Proposals to update the language of at service provision.

HEART Steps(8)	Synonyms	Sub-steps/elements	Proposals to update the terminology	
HEART Steps	Synonyms	Related steps/elements	Heerkens et al. (2011)[36]	Scherer (2019)[38]
1: Initiation	- Initiative - Identify a problem in functioning - Formulate a demand for care - Information about how to access...	Information about where and how to access supply, review, replacement (purchase/hire), or repair	Identifying a problem in functioning	- Referral - Intake and initial assessment
2: Assessment (evaluation of needs)	- Goal setting assessment - Evaluation - Support pathway facilitators and barriers	- Focus on person-centred goals - Health literacy - Peer support - Carers and support for carers	Formulating the need	Systematic assessment
3: Selection of the assistive solution (defining individual AT programme)	- Formulate a care plan - Selecting - Equipment trials +/- prescription - Equipment recommendation - Prescription	n/a	Drawing up a care plan;	Plan development
4: Selection of equipment (choosing specific equipment within AT programme)	- Typology selection - Choice of relevant device	n/a	Selecting	Recommendations and report
5: Authorisation (obtaining funding)	- Delivery - Funding and procurement - Submission of request for replacement / new equipment - Ordering of assistive devices (special fund for donations) - Payment	- Recycling of assistive devices - Stocking of devices and accessories - Record keeping for assistive devices - Self-purchase voucher record systems	Supplying the AT and instructing its use	Technology procurement and development
6: Implementation (delivering equipment to user, fitting and training)	- Use/ usage - Supplying the AT and instructing its use - Fabrication and fitting - Teaching and training plan - Product Preparation, Fitting, Training and Delivery	n/a	Using the AT	Implementation and training
7: Management and follow up (maintenance and periodic verification)	- Evaluating the effects on functioning - Follow-up - Maintenance - Repair (including training individuals in repair strategies)	- Outcome measurement - Quality management - Service improvement	Evaluating the effects on functioning	- Follow-along and case termination - Follow-up and re-referral

longstanding European service delivery steps developed from the HEART studies (8) remain applicable and have formed the basis of the majority of scholarly work regarding AT service provision. Synonyms and related steps were located and mapped, demonstrating a detailed and dynamic landscape. There are many different ways of stating, describing, collapsing, or expanding these steps, but the broad structure and process remain stable.

Several scholarly works propose a reworking of the language of the HEART steps, and a global framework to align service delivery process and service delivery quality. This is consistent with the WHO's focus on provision as a broader construct. The right AT provision framework can enable consistent, equitable, and measurable steps to be described for AT users across many contexts and use cases.

The review also shows that the AT sector are keenly interested in guidance. The term guideline is widely used in relation to an enormous array of manuscripts, from websites to position papers, and commentaries to fully worked technical guideline documents. Guidelines were identified for certain activity and participation outcomes, such as education and employment. Some guidelines focused on specific user groups (such as impairment types) or age groups, and others on focal AP types such as AAC, prosthetics, wheelchairs or dynamic arm supports).

The presence of guidelines appeared strongly related to the AT ecosystem at play. The lack of stated public guidelines may indicate that the **policy** battle is won – for example in some jurisdictions such as the National Health Service in England and

Scotland, authors are the providers of policy and funding, and it would appear that AT service provision steps are an accepted element of universal healthcare settings – reference to steps could be located within NHS Service Specifications (54, 56) and Commissioning Frameworks (50).

Guidelines appear to address a range of purposes. Guidelines from the US are authored by professional bodies (such as RESNA) and local regional school authorities, and the focus of their guidance is the championing of good practices within the specific funding contexts available. In other instances, the re-iteration of AT provision principles observed in Europe and in Australia appear to function as a systemic lobbying strategy to improve the services, systems, and policies that impact the capacity of AT personnel to deliver excellent provision systems, with agreed process steps, and AT users to achieve optimal outcomes.

A final discussion point relates to quality. This scoping review did not include quality criteria in our search or data extraction. As stated in the Methods section, trialling quality as a search concept in combination with the search string but reduced the yield dramatically, so “quality” was not used as a search concept or a selection criterion so as not to risk missing relevant publications. The widely varying calibre of the yield does indicate the importance of considering quality criteria in guideline development. The need for a systematic quality indicators framework to support effective AT provision has been identified in the literature and will be an important element of future guideline development

Table 5. From Andrich et al. towards a global quality framework for assistive technology service (7).

Criterion	Question	Indicator
Criterion 1: Accessibility	To what extent is the system, scheme or process...	a) [Awareness] ... known, communicated and clearly understood by the people who need AT? b) [Eligibility] ... accessible for anyone who needs AT? c) [Reachability] ... provided in locations that are easily reachable, physically accessible and at reasonable times available to the people who need AT? d) [Affordability] ... financially affordable by the people who need AT?
Criterion 2: Competence		a) [Knowledge] ... operated at each step by people who have adequate competencies and skills in relation to their duties or responsibilities? b) [Transparency] ... applied using clear procedures or evidence-based standards where all steps are tracked, objectives are declared, and meaningful outcomes are measured? c) [Safety] ... operated while ensuring that risks and safety issues are properly addressed and managed? d) [Information] ... making comprehensive and updated information on the available assistive solutions available to all actors involved?
Criterion 3: Coordination	To what extent does the system, scheme or process ensure ...	a) [Consistency] ...all steps of the individual AT intervention are well coordinated with each other? b) [Case managing] ... the AT intervention is well coordinated with all other individual health, care, wellbeing, education and social interventions? c) [Benefits] ... immediate and wider benefits of AT provision are captured, such as e.g.,access to education or employment or other life opportunities? d) [Ethics] ... the intervention is conducted in an ethical manner, in accordance with commonly accepted ethical principles of health, care and social interventions?
Criterion 4: Efficiency	To what extent is the system, scheme or process able to ...	a) [Timeliness] ... provide solutions to each individual's needs within reasonable time? b) [Effectiveness] ... make sure that the provided solution is effective in relation to the intended goals, and satisfactory from the user's viewpoint? c) [Accountability] ... keep track of the costs and the outcomes of each AT intervention? d) [Optimization] ... use costs and outcomes information to continuously improve the system (including products, processes, services) so as to maximize the outcome return on investment?
Criterion 5: Flexibility	To what extent does the system, scheme or process ...	a) [Products range] ... provide a range of assistive products which is wide enough to meet the varied individual needs of the served population, at an appropriate quality level?
Criterion 6: User centeredness		266 a) [Partnership] ... ask for the user's view and takes it into account at each stage of the intervention? b) [Empowerment] ... provide users with all information and knowledge needed to actively participate and take responsibility for the choices, in an informed and responsible manner? c) [Trials] ... give users the possibility to try out the proposed solutions before the final choice? d) [Freedom] ... give users the possibility to appeal against decisions that don't meet their agreement, or to make different choices?
Criterion 7: Infrastructure		a) [Data] ... avail reliable figures and information on numbers and types of people to use services? b) [Scoping] ... ensure that the right structure, systems, processes and skills are in place to meet needs? c) [Sustainability]... allocate adequate resources and adapt for growth in demand? d) [Involvement] ... involve user representatives in service planning, monitoring and assessment?

[59,60]. One recent development is a proposed global quality framework for AT service delivery [7]. This framework views the quality of AT service delivery steps according to 6 criteria, each with 4 indicators. A 4-point rating scale (1= adequate; 2=requiring improvement; 3=good; 4=outstanding) is suggested, see [Table 5](#) for criteria, questions, and indicators.

Conclusion

This scoping review has collated core evidence regarding universally applicable elements of service delivery within broader provision contexts. It is feasible to build on this body of work to enable global guidelines on the provision of AT that will support a unifying overarching inclusion framework and enable stakeholders to capture granular (detailed) guidance as needed for specific APs or contexts.

Implications of the current limited “patchwork” of guidelines in relation to current policy directions and unmet needs have been articulated in the WHO and UNICEF Global Report on Assistive Technology (2022). It is timely to address this.

Notes

1. <https://www.oxfordlearnersdictionaries.com/definition/english/guideline>.

2. These steps are based on the influential HEART study summarised in (Fagerberg, [9]). Different terminology may be used by publications and different/additional/fewer steps may be presented.

Acknowledgments

We gratefully acknowledge the contributions of our Joint Steering Group, Professor Cathy Holloway, A/Professor Diane Bell, and Dr Vicki Austin (GDI Hub) as well as Ms Kylie Shae (WHO). We further thank our partner organisations from GAATO, GDI Hub; AT2030, and the WHO GATE community for their invaluable support and contributions.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This project is part of AT2030, a programme funded by UK Aid and led by the Global Disability Innovation (GDI) Hub.

ORCID

Natasha Layton  <http://orcid.org/0000-0002-3213-8069>
 Alice Spann  <http://orcid.org/0000-0002-1825-686X>
 Mehedi Khan  <http://orcid.org/0000-0003-3229-3621>
 Silvana Contepomi  <http://orcid.org/0000-0003-3162-9947>
 Evert Jan Hoogerwerf  <http://orcid.org/0009-0008-0557-2688>
 Diane Bell  <http://orcid.org/0000-0003-2139-0012>
 Luc de Witte  <http://orcid.org/0000-0002-3013-2640>

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Appendix A1 Search string used in the CINAHL database

	Query	Results
S4	S1 AND S2 AND S3	2254
S3	guide* OR benchmark*OR checklist* OR standard* OR recommendation* OR direction* OR specification* OR advice OR instruction* OR characteristics OR requirements OR model*OR criteria OR framework	1,559,307
S2	(service or provision or provider or pathway) OR (initiative or contact or assessment or selection or authori*ation or funding or fitting or training or delivery or implementation or maintenance or follow-up)	2,716,720
S1	assistive AND (technolog* OR device*OR solution) OR ("self help device" or "self help tool")	13,981