Scoping review of quality guidelines for Assistive Technology provision

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Abstract

Background

The definition of ‘Assistive Technology’ (AT) includes both assistive products and the services or actions necessary for safe and effective provision of the assistive products to people who need them. International standards and product specifications exist for assistive products. Despite huge unmet need for effective AT provision, a variety of service delivery models across different countries, and a shortage of personnel trained in this field, no widely useable and accepted AT service provision guidelines currently exist. Aligned with contemporary global initiatives to improve access to AT, a scoping review was commissioned to inform the development of globally useable provision guidance. The aim was to deliver a rapid scoping review of the literature regarding quality guidelines for AT service provision.

Method

The rapid scoping review utilised a two-tiered approach to identifying relevant publications: 1) systematic search of academic databases; 2) consultation with assistive technology organisations. The review was conducted in March 2023 across four databases (Medline, CINAHL, SCOPUS and Google Scholar) with no date limitations. Systematic outreach to international and global AT networks was used to access expert informants. Non-English publications were included utilizing Google Translate and support from expert informants to verify content. Analysis was guided by the body of work on quality AT provision and service delivery processes in Europe, as well as the World Health Organization-GATE 5P framework for strengthening access to AT.

Results

The search strategies yielded 41 publications from diverse countries, and directed at differing assistive products, personnel and provision contexts. Results are reported from the charted data through to the data extraction framework, including type of publication, study design, audience and reach. We report on the type of AT and the AT provision ecosystem elements discussed, and service delivery process or steps and quality criteria service delivery.

Conclusion

This review did not find established guidelines or standards for service provision, but it did identify key service delivery steps which may form part of such guidelines, and many of the

publications included mentioned the need for practice guidelines. Despite different contexts such as type of assistive product, recipient of the guidance, language, location and authorship, core elements of AT provision including service delivery steps can be identified. Consideration regarding the nuances of vocabulary, of process, and of enabling flexible foci, is recommended in systematizing globally applicable guidance. **This review offers a strong starting point for developing guidance for assistive technology provision to meet global need.**

1. Introduction

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

AT refers to both assistive products and the services or actions necessary for the safe and effective provision of the assistive products to people who need them [2]. International standards and product specifications exist for assistive products, see for example the assistive product classification and terminology standard [3] and assistive product specifications [4]. 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 assistive technology [5] and the subsequent WHO/ UNICEF Global Report on AT [6]. AT journals contain a growing body of expert opinion and consensus statements regarding AT provision and service delivery. Vocabulary differs, 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. The focus upon various process elements or quality indicators also differs, as does exactly which type of assistive product is being discussed, and the nature of the target audience. As yet no widely useable and accepted guideline exists to support '*service delivery or provision of assistive products and related services*'[6] .

1.1 Service provision and service delivery?

The WHO conceptualise 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 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].*

A consortia of AT experts led by Andrich describe an assistive technology 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]*. Concurring with the WHO vision of

[1] https://www.oxfordlearnersdictionaries.com/definition/english/guideline

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].*

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.

1.2 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 essential service delivery steps which form a process through which an AT user goes, and is delivered by AT services [8]. Critical review of these steps in subsequent decades and summed across three AAATE position papers, demonstrated their ongoing relevance [9-13]. 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 assistive products, yet noted service delivery steps are not consistently used in practice [14]. For example, WHO publications describe AT service provision steps ranging in number from 8 steps in relation to wheelchair provision [15] to 4 steps in relation to training in assistive products [16] and prosthetics and orthotics [17]. Nevertheless, our premise is that core elements are universally applicable, as discussed within the Global GReAT Consultation [18]. 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 [19].

This paper 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.

2. 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 [20,21].

2.1 Identifying the research question

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

> *What quality guidelines exist for assistive technology service provision*?
>
> W*hat do authors in this field see as key elements of such guidelines?*

2.2 Identifying relevant publications

This rapid scoping review utilised a two-tiered approach to identifying relevant publications: 1) systematic search of academic databases; 2) consultation with assistive technology organisations. Both tiers are now discussed in detail.

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

The systematic literature search was conducted in four relevant academic databases: MEDLINE (focus on medicine), CINAHL (focus on nursing and allied professions), SCOPUS, and Google Scholar (both multidisciplinary). At the start of the review, the research question was operationalised using the ECLIPSE mnemonic. ECLIPSE is a tool to help prepare search strategies for health management topics. The acronym stands for **E**xpectation, **C**lient group, **L**ocation, **I**mpact, **P**rofessionals, and **SE**rvice [22]. 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.

Table 1: Search concepts using ECLIPSE (Wildridge & Bell, 2002) and in-/exclusion criteria

ECLIPSE	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 steps[2]**:** • 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)

[2] These steps are based on the influential HEART study summarised in (Fagerberg, 2011). Different terminology may be used by publications and different/additional/fewer steps may be presented.

Using the E and SE concepts, four different search strategies were constructed and trialled 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 trialled 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[3]. Search terms representing the “service provision” concept were identified based on the seven steps outlined by the HEART study [8]. Search terms referring to various assistive products (based on the WHO Priority Assistive Products List; [23]) were utilised within the trial searches but ultimately yielded an unfeasible amount 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 time of publication, language, or publication format. The final search string (see table 2) was initially used in the CINAHL database and then adapted for the remaining databases.

Table 2: Search string used in the CINAHL database

	Query	Results
S4	S1 AND S2 AND S3	2,254
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

The search resulted in a total of 11,503 publications from all four databases. Titles and abstracts of the 8,626 publications remaining after the removal of duplicates were screened for eligibility by NL, SC, and MK. A random sample of 300 publications were each screened independently by all three reviewers. This process ensured that all reviewers had a sound understanding of the eligibility criteria. There was disagreement in only 4% of the 300 publications, indicating a very high degree of agreement. Thus, the remaining publications were divided between NL, SC, and MK for independent screening. Any remaining uncertainty was resolved through discussion. The main reasons for excluding publications were: 1) not a guideline; 2) guideline, but for AT research

[3] The term quality was used within the yield to find out what authors say about quality.

and development; 3) application of a known guideline; 4) argues why AT provision guidelines are needed, and 5) guidelines for training personnel. This process resulted in the identification of 21 publications that fit the eligibility criteria. Four of those were excluded as their full texts were not accessible. This left **17 publications** to be included in the analysis.

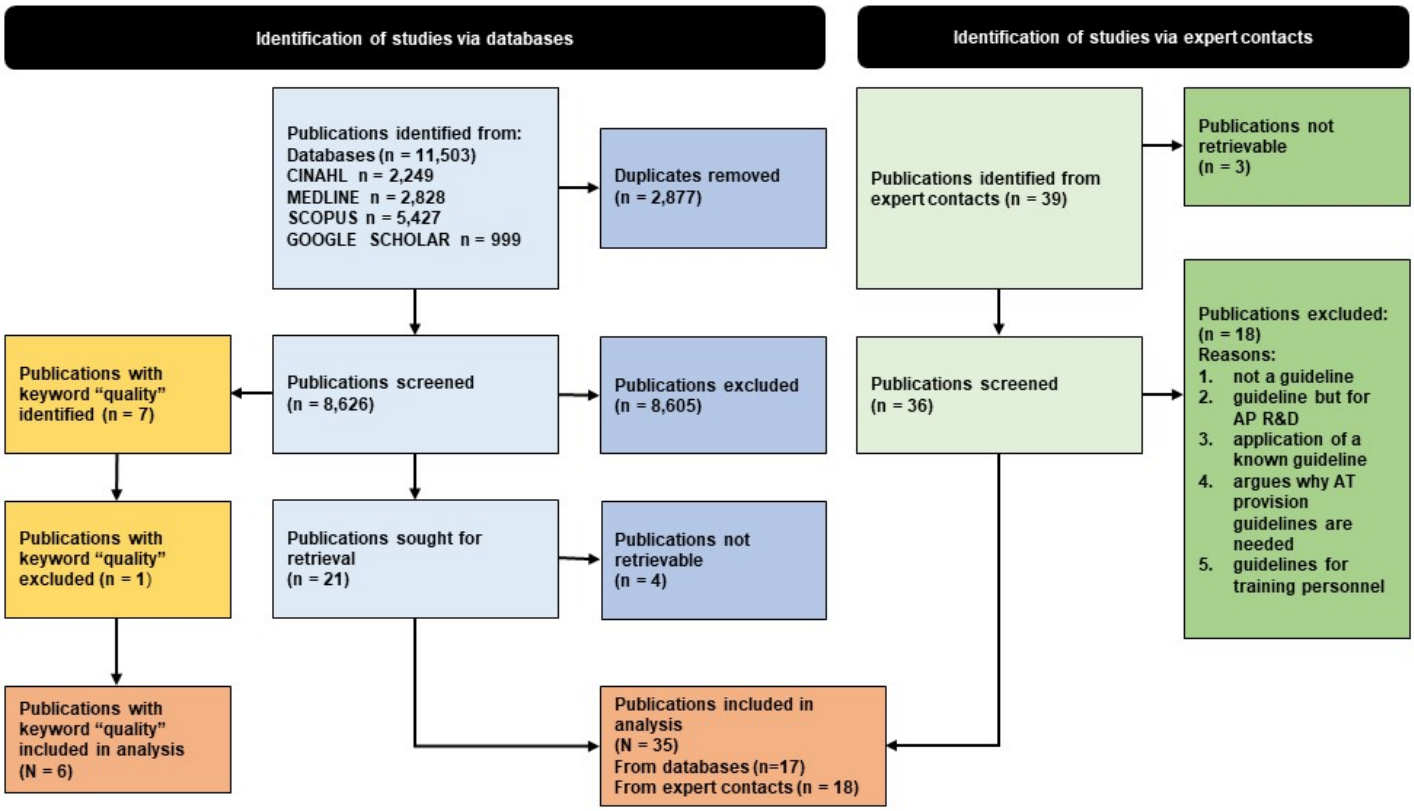
2.2.2. Tier 2: consultation with assistive technology organisations

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 sources are generally referred to as “grey literature” and 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 and to members and associate members of the Global Alliance of Assistive Technology Organizations (GAATO). In addition, the call was individually sent to 24 global bodies via the Global Disability Innovation (GDI) Hub. The experts in the field of assistive technology service provision were thus asked to forward any publications they had access to which were relevant to the research question. In total, 39 publications (including reports and websites) were received from 21 different organisations. Two 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**.

In addition, an automated search of the yield of both Tier 1 and Tier 2 was run to locate titles containing the term ‘quality’. These are contained in Appendix 3. Secondly, the results of the automated search regarding the term ‘quality’ and commentary on the nature of process and quality.

The Tier 1 & 2 search process is depicted in the flow chart in Figure 1. Appendix 1 and 2 contains the yield from Tier 1 and Tier 2 searches.

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



2.3 Charting the data

Relevant information was extracted from the included publications using a data extraction framework divided into the following sections: 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) the six categories of priority assistive products (mobility; self-care; vision; hearing; communication; cognition) were also utilized for data extraction [23] and E) service delivery steps mentioned.

2.4 Organizing, summarizing and reporting the findings

The findings are structured in three ways. Firstly, the results obtained from the charted data through the data extraction framework including publication date, method and type of publication, reach of the publication (global, regional, national, local), assistive product type and audience.

3. Results

3.1 Description of the included publications

Thirty-five publications underwent full data extraction, including 18 (51%) sourced from databases, and 17 (49%) from expert contacts. See Table 3 Overview of included publications.

Table 3: Overview of included publications

Abbreviations: 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

NO		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	AUTHORI-SATION	IMPLEMEN-TATION	MANAGE-MENT & FOLLOW UP	Additional steps
TIER 1 PUBLICATIONS	34	Zabala (2020)	B	S (qual)	global	n/a	people, personnel, providers	Y	Y	Y	N	N	Y	Y	Y
	47	Tuikka & Sachdeva (2017)	CP	C	national (FIN)	n/a	all 5 Ps	N	N	Y	N	Y	N	Y	Y
	61	Lenker et al. (2004)	JA	C	global	all AT	all 5 Ps	N	N	N	N	N	N	N	Y
	29	Dietz et al. (2012)	JA	S (qual)	national (USA)	COM	people	N	Y	Y	Y	N	Y	N	Y
	55	Dolan (2013)	JA	S (qual)	national (UK)	M	all 5 Ps	N	Y	N	N	N	Y	Y	Y
	63	Schoech et al. (1993)	JA	S (qual)	national (USA)	all AT	all 5 Ps	N	Y	N	Y	N	Y	Y	Y
	38	Scherer (2019)	B	S (qual)	global	all AT	all 5 Ps	Y	Y	Y	Y	Y	Y	Y	Y
	64	Steel & de Witte (2011)	JA	C	regional (EU)	all AT	all 5 Ps	Y	Y	Y	Y	Y	Y	Y	Y
	60	Joddrell & Cudd (2015)	JA	S (qual)	global	COG	people	Y	N	Y	N	Y	Y	Y	Y
	37	Heerkens et al. (2011)	JA	C	national (NLD)	all AT	people	N	Y	Y	N	N	Y	Y	Y
	59	Federici et al. (2014)	JA	C	global	all AT	people, personnel, providers	Y	Y	Y	Y	Y	Y	Y	Y
	30	Barfati & Boman (2014)	JA	C	national (SWE)	COG	people, personnel	Y	Y	N	Y	N	Y	Y	N
	58	Andrich (2022)	R	C	global	all AT	people, personnel, providers	N	N	Y	Y	N	Y	Y	N

	62	Scherer (1996)	JA	C	global	M, SC, COM, V, H	personnel, providers, policy & funding, other	N	N	N	N	N	N	N	Y
	26	Delisa & Greenberg (1982)	JA	C	local (USA)	M	personnel, providers	N	N	Y	N	Y	N	N	Y
	65	Wild (2013)	JA	C	national (USA)	COG	personnel	N	N	N	N	N	Y	Y	Y
	36	Shay et al. (2019)	B	n/a	global	n/a	personnel	Y	Y	Y	Y	Y	Y	Y	N
TIER 2 PUBLICATIONS	6	WHO (2022)	R	C	global	all AT	all 5 Ps	Y	N	Y	Y	N	Y	Y	N
	14	WHO (2008)	R	SGDP	regional (LMIC)	M	all 5 Ps	Y	Y	N	Y	Y	Y	Y	Y
	11	ARATA (2016)	PP	C	n/a	all AT	all 5 Ps	Y	Y	Y	Y	Y	Y	Y	Y
	16	WHO (2017)	R	SGDP	global	M	all 5 Ps	N	Y	N	Y	N	Y	Y	N
	23	AT professional organisation Fukusen (nD)	R	n/a	national (JPN)	all AT	personnel, policy & funding	N	Y	Y	Y	Y	Y	Y	N
	31	Connecticut State Deparment of Education (nD)	R	n/a	local (USA)	n/a	people, personnel	Y	Y	N	N	Y	N	Y	Y
	32	North Dakota Department of Public Instruction (2015)	R	n/a	local (USA)	n/a	people, personnel	N	Y	Y	Y	N	Y	Y	N
	33	Michigan Region IV Assistive Technology Consortium (2021)	R	n/a	local (USA)	n/a	personnel	Y	Y	Y	Y	N	N	N	Y
	25	Brentnall L, Mines K, McGrath K, et al: Motivation Australia (2016)	R	SGDP	national (PNG)	V, H, M	all 5 Ps	Y	Y	Y	N	Y	Y	Y	Y
	42	Enable NSW & LifeTime Care and Support (LTCS) Australia (2011)	R	SGDP	national (AUS)	M	all 5 Ps	Y	Y	N	Y	N	Y	Y	Y
	68	iCARE NSW & Lukersmith (2021)	R	SGDP	national (AUS)	M, SC	all 5 Ps	Y	Y	Y	Y	Y	Y	Y	N
	27	NSW Agency for Clinical Innovation, Australia (2014)	R	SGDP	national (AUS)	M, SC	all 5 Ps	Y	Y	Y	Y	Y	Y	Y	Y
	24	Department of Health South Africa (2003)	R	n/a	national (ZAF)	all AT	N/a	N	Y	N	Y	Y	Y	Y	Y
	66	Dahlberg et al. (2014)	JA	C	national (SWE)	all AT	all 5 Ps	Y	N	Y	N	N	Y	Y	Y
	43	RESNA (2011)	R	SGDP	national (USA)	M	all 5 Ps	Y	Y	Y	N	Y	Y	Y	Y
	49	Andrich et al. (2019)	CP	C	global	all AT	all 5 Ps	Y	Y	Y	Y	Y	Y	Y	Y
	28	Van Der Heide et al. (2017)	JA	S (qual)	national (NLD)	M	people, personnel	Y	Y	Y	Y	Y	Y	Y	Y
	10	AAATE (2018)	PP	R	regional (EU)	all AT	all 5 Ps	Y	Y	Y	Y	Y	Y	Y	N

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 (see Figure 3).

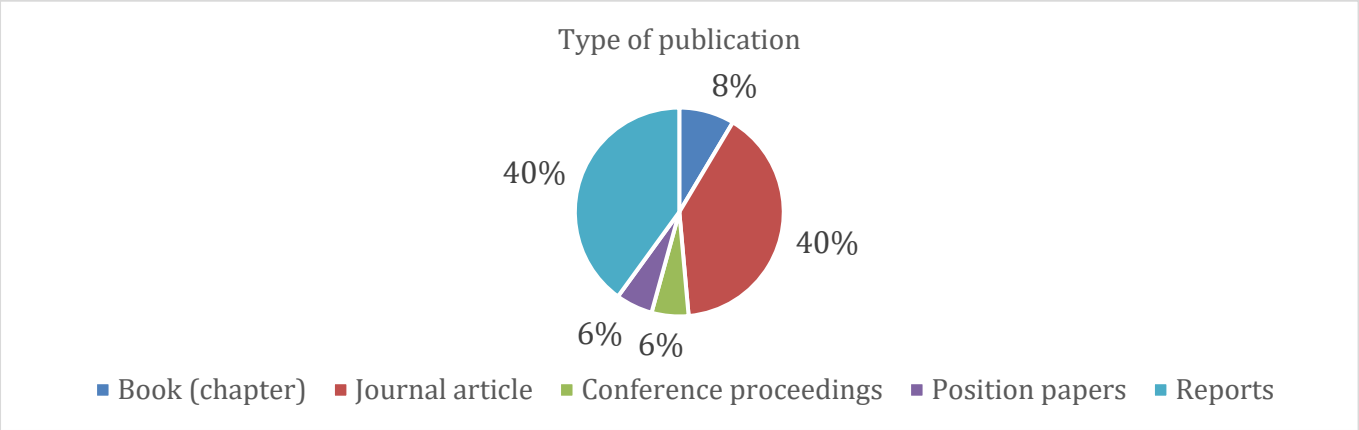


Figure 2: Type of publication

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. 3% could not be classified (Figure 3).

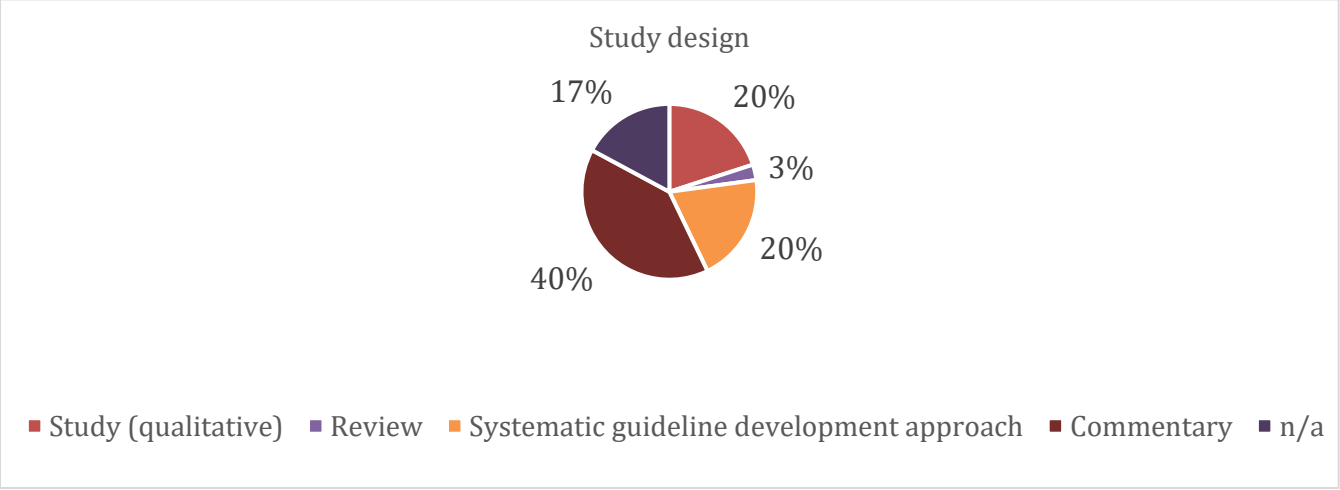


Figure 3 Study design

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) (Figure 4). The majority (n=29) of the included publications has been published after 2010.

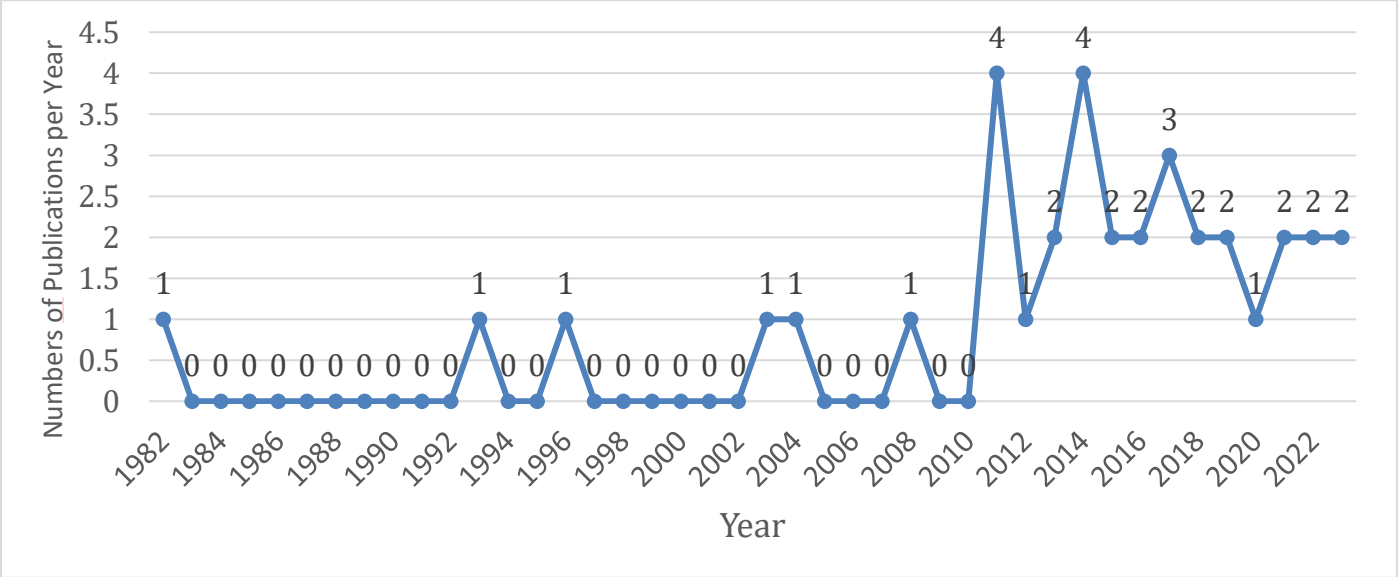
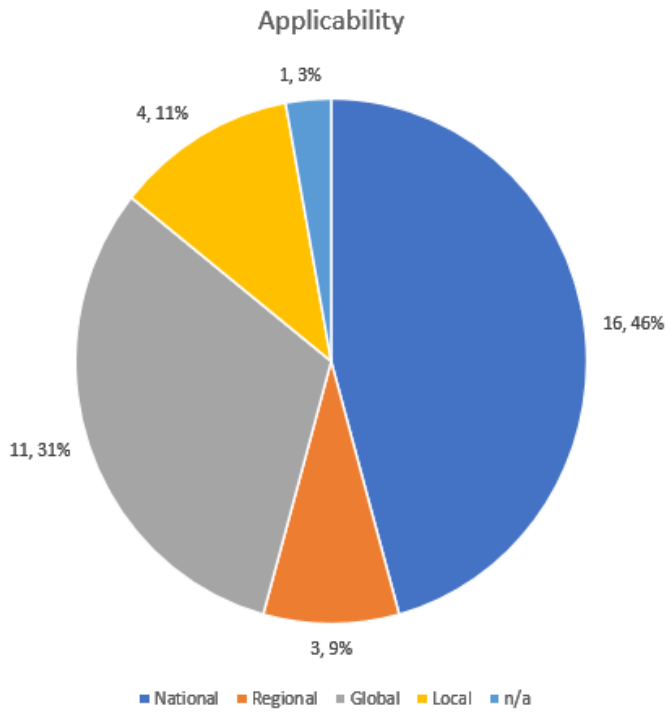


Figure 4: Publication range

We sought information as to the (self-defined) global, national, or regional (self-defined) 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 Europe), or inferred from the country and institution of origin of the authors. Figure 5 demonstrates that the majority of guidelines were national in focus (Figure 5).



National (n=15)	
USA	4
AUS	3
SWE	2
FIN	1
JPN	1
NLD	2
PNG	1
UK	1
ZAF	1

Regional (n=3)	
EU	2
LMIC	1

Local (n=4)	
USA	4

Figure 5: Geographical applicability of guidelines

The only global guidelines related to specific assistive products (manual wheelchairs, prosthetics and orthotics). Guidelines covering global regions were published by the WHO and include

standards for prosthetics and orthotics [17] and the provision of manual wheelchairs in less resourced settings [15]. The national guidelines spoke to the policy context of the particular country. National publications included Japan's guideline for the formulation of assistive product service plans [24], the standardization of provision of assistive devices in South Africa [25], and national guidelines on the provision of AT in Papua New Guinea [26]. Other publications provided commentaries upon AT service provision for nations or regions such as Europe. Some publications were conducted by government or statutory bodies and could be relevant at a national level or were authored by national leadership bodies and aimed to provide national guidance. Finally, some publications addressed local needs such as guidelines for the provision of AT in educational contexts in certain US states.

Fourteen publications mentioned all AT groups (mobility; self-care; vision; hearing; communication; cognition [23]), and 4 publications mentioned more than one AT group (between 2 and 5). Most publications (n=10) addressed guidelines for mobility AT. Vision and hearing AT were least mentioned (n=1 each). Six publications spoke about AT provision generally (Figure 6).

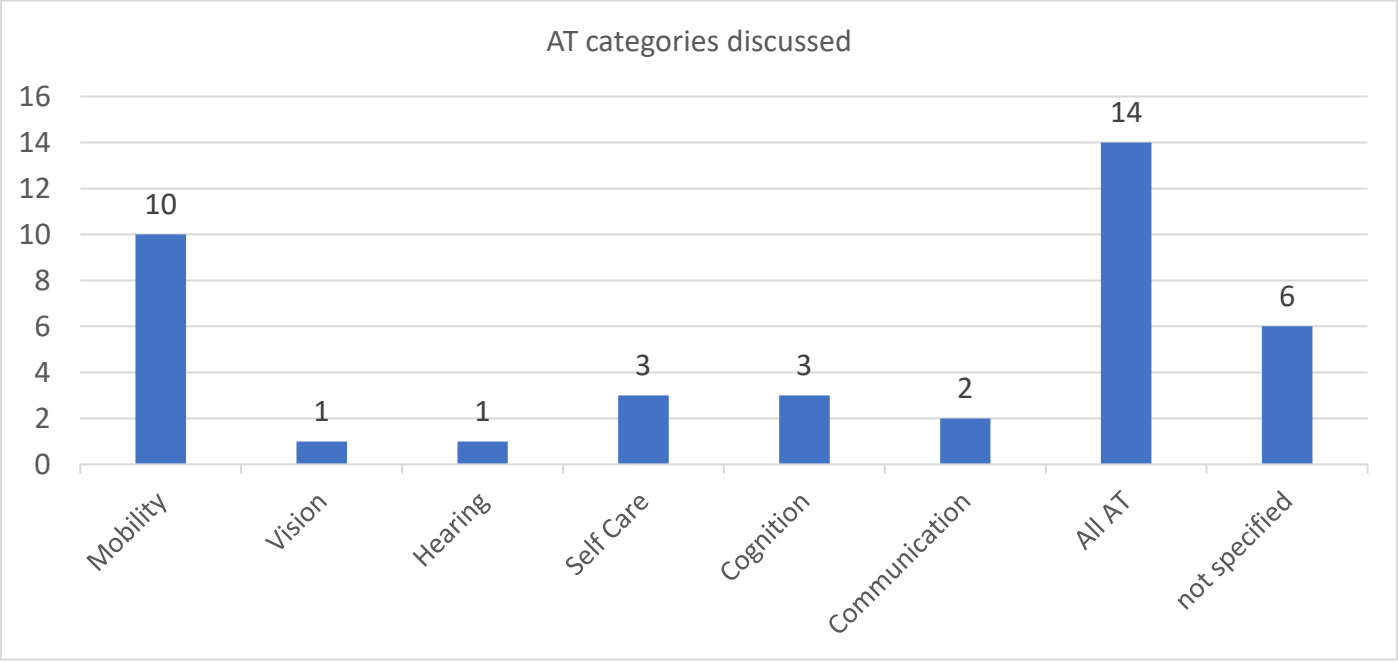


Figure 6: Coverage of assistive products

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 utilized as target groups for data extraction (Figure 7), noting AT product stakeholders such as manufacturers/ designers are not included because separate guidelines address product research and development. Further, the 'other' category includes

researchers. Eighteen publications mention all 5 Ps, 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).

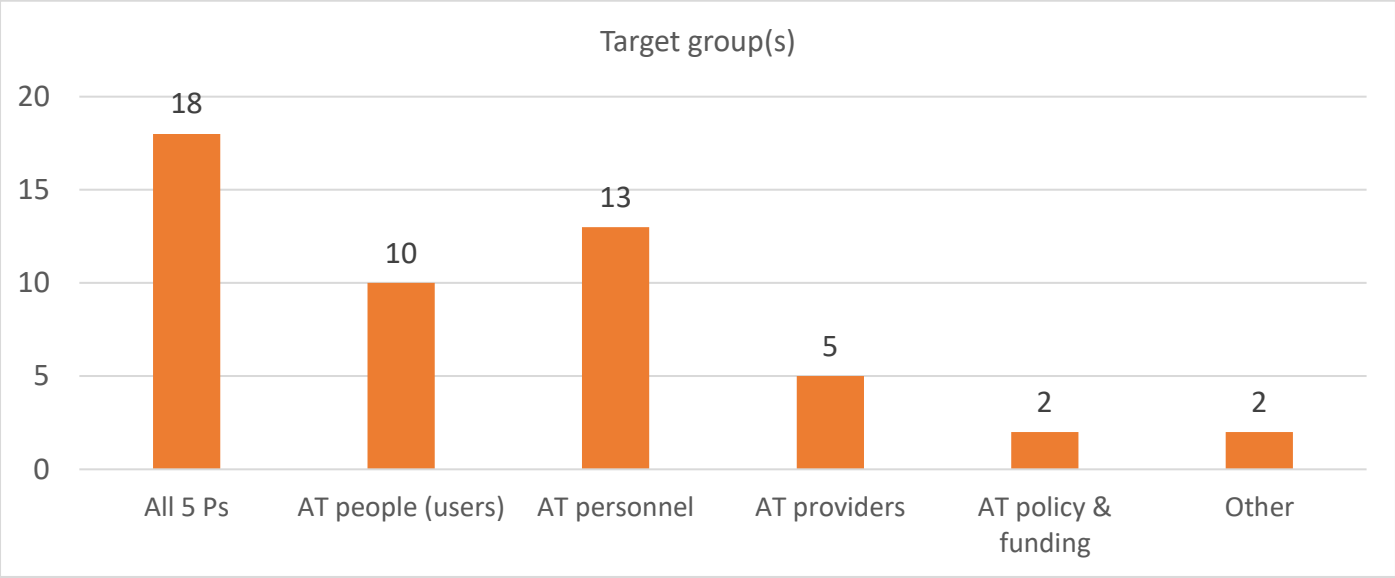


Figure 7: Target groups (NOTE product stakeholders such as developers excluded as separate guidelines applicable)

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 [27] or within a model of care for pressure care[4] [28]. 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 [29].

Regarding 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, can be crosswalked to the HEART steps [30]. Likewise in cognition products for dementia, the steps of 1) meeting the client; 2) goal setting; 3) assessment; 4) choice of relevant device; 6) teaching and training plan; and 7) follow-up, are recognizable [31].

[4] The HEART steps are situated in relation to Phase 1 - Health Promotion; Phase 2 Phase Intervention; Phase 3a Restoration and Rehabilitation; Phase 3b Quality of Life Maintenance

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 [32-34] 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 [35] and Quality Indicators for Assistive Technologies (QIAT) [36]. Table 3 maps the HEART steps with some examples of terms from the functional areas of education and vocation, as well as the assistive product area of mobility.

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 [37]**	**AT for mobility: prosthetics**	**AT for mobility: wheelchairs [15] [38]**	**TAP (training in assistive products) steps [39,40]**
Initiation	Consideration	Intake and initial assessment		1. Referral and appointment	Assessment
Assessment (evaluation of needs)	Assessment / evaluation Problem identification	Systematic assessment	Assessment	2. Assessment	
Selection of the assistive solution (defining individual AT programme)	Conducting trials	Plan development	Fabrication and fitting	3. Prescription (selection)	
Selection of equipment (choosing specific equipment within AT programme)	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

Across the yield, AT provision step descriptors were described in different ways but broadly mapped to the foundational HEART study steps (Figure 8).

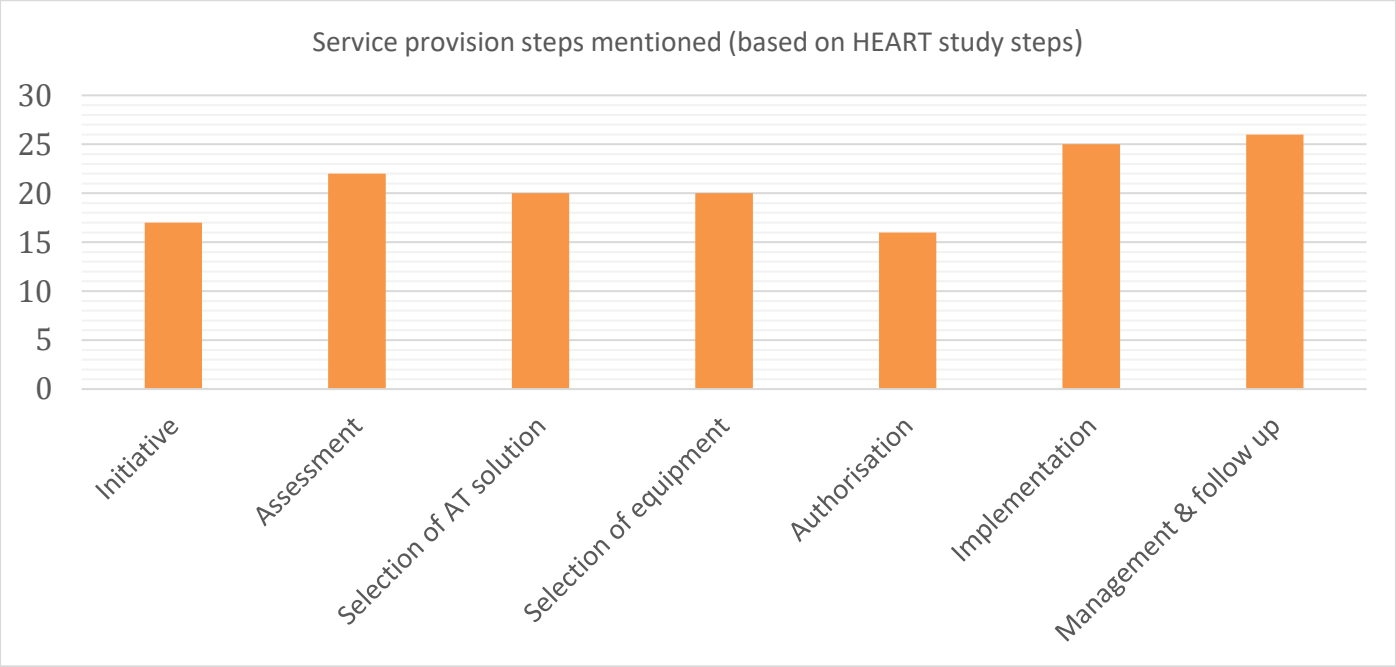


Figure 8: Service provision steps mentioned

Table 4 links the HEART steps with some of the synonyms located. Related steps or elements are also provided in column 3.

Table 4: HEART steps and synonyms

HEART Steps [8]	Synonyms	Related steps or elements
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
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
3. Selection of the assistive solution (defining individual AT programme)	• Formulate a care plan • Selecting • Equipment trials +/- prescription • Equipment recommendation • Prescription	n/a
4. Selection of equipment (choosing specific equipment within AT programme)	• Typology selection • Choice of relevant device	n/a
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[5]

[5] Department of Health, S. A. (2003). *Standardisation Of Provision Of Assistive Devices In South Africa: A Guideline For Use In The Public Sector*. Retrieved from South Africa

		• Parallel processes needed for self-purchase voucher system being used as well as usual provision process[6]
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
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

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 *[28].*

Several publications consider the broader ecosystem and suggest additional steps such as disseminating basic information about the needs for and benefits of using an assistive product, and using a screening tool to identify those who can benefit from available services [15].

There were several proposals to update the language of AT service provision as depicted in Table 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 [41]. An updated vocabulary is proposed 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 [42].

[6] Dahlberg, R., Blomquist, U., Richter, A., & Lampel, A. (2014). The service delivery system for assistive technology in Sweden: Current situation and trends. *Technology and Disability, 26*(4), 191-197.

Table 5: Proposals to update the language of AT service provision

	HEART Steps	**Heerkens et al (2011)** ***[41]***	**Scherer (2019) [42]**
1.	Initiation	Identifying a problem in functioning	Referral
			Intake and initial assessment
2.	Assessment (evaluation of needs)	Formulating the need	Systematic assessment
3.	Selection of the assistive solution (defining individual AT programme)	Drawing up a care plan;	Plan development
4.	Selection of equipment (choosing specific equipment within AT programme)	Selecting	Recommendations and report
5.	Authorisation (obtaining funding)	Supplying the AT and instructing its use	Technology procurement and development
6.	Implementation (delivering equipment to user, fitting and training)	Using the AT	Implementation and training
7.	Management and follow up (maintenance and periodic verification)	Evaluating the effects on functioning	Follow-along and case termination
			Follow-up and re-referral

a. Analysis of the term 'quality' in the retrieved publications

AT service provision literature frequently refers to both the steps or processes which ought to be followed, and how the quality of these steps or processes might be articulated and measured. As described in the methods section, including 'quality' as a search term confounded the yield as many relevant guidelines did not contain the word quality in their titles or abstracts. An automated word search for 'quality' within titles from the original searches, generated six additional references (Appendix 3).

The dominant quality framework across the yield and four of the additional 6 publications [14,43-45] are the six HEART study quality indicators of accessibility, competence, coordination, efficiency, flexibility, and user influence [10](p14). The WHO International Classification of Functioning, Disability and Health is also cited as a framework with which to benchmark quality [45-47]. One article used a set of employment outcome indicators across nine categories[7][48], while clinical outcome measurement tools were the focus of two studies [44,49]. Quality indicators for education[8] [36] were described above.

Several publications referred to the guiding principles of primary health care when discussing quality service provision. That is, inferring the provision process is only as good as the

[7] 1) Organizational Governing Structures, (2) Personnel, (3) Consumer Outcomes, (4) Policies and Procedures, (5) Stakeholder Collaboration, (6) Service Delivery Models, (7) Individualized Matching of Person and Technology, (8) Funding, and (9) Quality Control and Evaluation

[8] The Quality Indicators for Assistive Technologies (QIAT)

underpinning systems enabling **availability** (the volume of assistive devices); **accessibility** (the geographic relationship between the providers and/or maintainers of assistive technology and the users of the products); **accommodation** (the makeup of the organization providing or supporting devices and the ease with which the client uses devices within it); **affordability** (the client's financial ability to pay for products and perception of value); and **acceptability** (the attitudes of those who receive products [50]. Authors writing about provision in Finland discuss **availability** (the knowledge about different technologies and services related to them); **accessibility** (a person's possibilities to get the AT they need); and **adoption** (communication between service providers and the experiences from continued usage of AT) [51].

Combining process and quality

The need for a systematic quality indicators framework to support effective AT provision has long been discussed [48,52]. One recent development is a proposed global quality framework for assistive technology service delivery. 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 to enable any professional or organisation, to identify points for improvement and build a '*framework for benchmarking and comparison and driving continuous improvement' [7]* (p265). Table 6 below contains criteria, questions, and indicators:

Table 6: 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 that …	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	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?

	process able to …	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? 266
Criterion 6: User centeredness		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?

3.3 Findings about AT provision and service delivery processes within related and excluded publications

Of 8,626 publications screened, 15 documented the application of known guidelines, usually HEART steps. Seventy-three publications were guidelines for research and development into assistive products, and the remainder were either not a guideline; or were guidelines for training personnel. Multiple calls were made for the development of **AT provision guidelines, with 128 manuscripts proposed that AT provision guidelines are needed**.

The scoping review located mentions of AT provision and service delivery processes within a wide range of publications. These publications did not fit the criteria of AT service provision guidelines. They did however illustrate the way different AT ecosystem stakeholder groups see the importance of service provision, and how they envisage service provision steps. The WHO GATE 5P framework is used to explore where these statements sit, illustrated by Figure 9 below.

Policy: Reference to provision (the need for it, any processes and steps relating to it) can be located in conventions, statutes and other high level policy documents. For example the WHO Rehabilitation Guidelines allude to service provision. Related tools such as the AT Capacity assessment [53] define service provision as '*chronological stages of service that ensure appropriate provision of assistive products to end-users. The steps include assessment and prescription, fitting, user training and/or follow-up, maintenance and repairs'* (p 37) and specify that provision of assistive products to end-users must include least one service provision step.

Provision: The majority of this scoping review discusses provision guidelines as explored by those stakeholders interested in providing quality services to AT users. A further source of data on AT service provision processes was located in the grey literature of commissioning agents, that is, providers who have budgets to spend on obtaining assistive products and services [54].

Personnel: The competency standards of allied health and other professions for whom AT is part of their scope of practice, contains mentions of AT service delivery elements. These are written in the language and terms of that profession. Some writing synthesises these competencies across professions [55], for example RESNA specifies *the role of the AT professional is to acquire information; screen and evaluate; develop and implement interventions* [56]. Other work such as by National Health Service Scotland addresses specific assistive product clusters for example augmentative and alternative communication [57] or wheelchairs and seating [58].

Products: A wide range of documentation provides guidance as to the development of products, and where products fit in relation to the supply network such as the AT2030 product narratives, for example [59].

International and national standards are another significant area of documentation. The assistive product classification and terminology standard (*ISO 9999)*[9] offers a nomenclature for assistive products, defined as products that optimise a person's functioning and reduces disability. Service provision steps are out of scope for this standard. The general requirements and test methods standard *ISO 21856*[10] provides safety requirements and recommendations for assistive products and serves as reference material when developing standards for a particular type of assistive product. It is intended for medical devices and covers aspects of risk, useability, materials and safety. Section 4.3 on Clinical evaluation and investigation directs professionals how to clinically evaluate an assistive product – while this is a sub-step contributing to AT service provision it is not linked to AT users or provision processes overall. The standard for quality management systems of medical devices *ISO 13485:2016*[11] *i*ncludes content that could be linked to service provision under the categories of product requirements, test methods, and quality management.

Little was located related to the perspectives of AT users themselves regarding AT service provision guidelines.

[9] ISO. (2022). *ISO 9999 Assistive products - Classification and terminology*.
[10] *ISO 21856:2022 Assistive products — General requirements and test methods*
[11] *ISO 13485:2016 Medical devices — Quality management systems — Requirements for regulatory purposes*. Retrieved from https://www.iso.org/standard/59752.html

Figure 9: Approaches taken to AT service provision across perspectives from the WHO-GATE 5P framework

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 and quality criteria for AT provision. There was 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 assistive products which exist.

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, 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 assistive product 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 [58,60] and Commissioning Frameworks [54].

Speaking to AT stakeholders more broadly, 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 which impact the capacity of AT personnel to delivery excellent provision systems, with agreed process steps, and AT users to achieve optimal outcomes.

In April 2023, the World Health Organization in conjunction with the International Society of Wheelchair Professionals and ISPO, published a set of Wheelchair Provision Guidelines [61]. These Guidelines were published just after the close of data collection but were subsequently reviewed for inclusion in this Scoping Review. The 2023 Wheelchair Provision Guidelines reference eight service delivery steps from the 2008 WHO Wheelchair guidelines [15]. Four key service delivery steps are now proposed, aligned to the WHO Training in Assistive Products initiative, with the following rationale: '*this consolidation is intended to ensure a greater relevance across all settings, and reflects both the development of the sector and ongoing expansion of audiences*' (p7). Accompanying the four service level recommendations (select; fit; train; follow-up) are three system level recommendations (competent workforce; seamless referral and access; systematic evaluation). The content of these recommendations is consistent with the body of evidence presented in the scoping review, and the order in which they are presented invites a rethinking of ways to arrange service delivery and service provision descriptors.

Conclusion

At the heart of AT provision lies the processes or steps by which an AT user obtains their AT and attains their goals. This scoping review canvassed the AT provision evidence base, with a focus on the user within a service delivery process. The 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 remains 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 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.

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 assistive products or contexts.

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

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70. Dahlberg R, Blomquist U, Richter A, et al. The service delivery system for assistive technology in Sweden: Current situation and trends. Technology and Disability. 2014;26(4):191-197.
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72. iCare. Guidance on the support pathway for people with a limb amputation. In: Lukersmith S, editor. Sydney, NSW: iCARE; 2021.

Appendix 1: Systematic search of academic databases

References marked with an asterisk were included in the analysis

*Re-trieved	Tier 1: Systematic search of academic databases
*	Andrich, R. (2022). *A Model to Represent Knowledge about Assistive Products.* Paper presented at the Computers Helping People with Special Needs, 18th International Conference, ICCHP-AAATE 2022, Lecco, Italy [62]
*	Bartfai, A., & Boman, I.-L. (2014). A multiprofessional client-centred guide to implementing assistive technology for clients with cognitive impairments. *Technology and Disability, 26*(1), 11–21. doi:https://doi.org/10.3233/TAD-140400 [31]
X	Berner, Kevin (2016) Outcomes of assistive technology services in a community based organization Boston University. ProQuest Dissertations Publishing 10194439.
X	Chisholm, W., Vanderheiden, G., & Jacobs, I. (2001). Web content accessibility guidelines 1.0. *interactions, 8*(4), 35–54. doi:10.1145/379537.379550
*	Delisa, J. A., & Greenberg, S. (1982). Wheelchair prescription guidelines. *American family physician, 25*(4), 145-150. [27]
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*	Federici, S., Corradi, F., Meloni, F., Borsci, S., Mele, M., Dandini de Sylva, S., & Scherer, M. (2014). A Person-Centered Assistive Technology Service Delivery Model: a framework for device selection and assignment. *Life Span and Disability, XVII*(2), 175-198. [63]
*	Heerkens, Y. F., Bougie, T., & Jonker, H. K. (2011). *A basic guideline for the provision of assistive products in the Netherlands*. In: G.J Gelderblom (ed) Everyday Technology for Independence and Care. ISO Press pp 1149-1154 [41]
*	Joddrell, P., & Cudd, P. (2015). *Applying guidelines for evaluating digital technologies for people living with dementia: A case study.* Paper presented at the AAATE Conference. Budapest, Hungary [64]
*	Lenker, J., & Paquet, V. (2004). A new conceptual model for assistive technology outcomes, research and practice. *Assistive Technology, 16*(1), 1-10. [65]
*	Scherer, M. (1996). Outcomes of assistive technology use on quality of life. *Disability & Rehabilitation, 18*(9), 439-448. doi:doi/abs/10.3109/09638289609165907 [66]
X	Parette, H. P., & Dempsey Marr, D. (1997). Assisting children and families who use augmentative and alternative communication (AAC) devices: Best practices for school psychologists. *Psychology in the schools, 34*(4), 337-346
*	Scherer, M. (2019). Chapter 6 - Overview of the assistive technology service delivery process: An international perspective. In A. F. Shay (Ed.), *Assistive Technology Service Delivery* (pp. 89-101): Academic Press.[42]
*	Schoech, D., Cavalier, A., & Hoover, B. (1993). A Model for Integrating Technology into a Multi-Agency Community Service Delivery System. *Assistive Technology, 5*(1), 11-23. doi:10.1080/10400435.1993.10132203 [67]
*	Shay, A. F. (2018). *Assistive Technology Service Delivery: A Practical Guide for Disability and Employment Professionals*. London: Elsevier [37]
*	Steel, E., & de Witte, L. (2011). Advances in European Assistive Technology service delivery and recommendations for further improvement. *Technology and Disability, 23*, 131-138 [68]
*	Tuikka, A.-M., & Sachdeva, N. (2017). *Experiences from Assistive Technology Services and Their Delivery in Finland.* Paper presented at the 16th Conference on e-Business, e-Services and e-Society (I3E), Delhi, India [51]

X	*Web Content Accessibility Guidelines (WCAG) 2.0*. (2008). Authors: Caldwell, B., Cooper, M. Reid, LG., Vanderheiden, G. Retrieved from http://www.w3.org/TR/2008/REC-WCAG20-20081211/
*	Wild, M. (2013). Assistive Technology for Cognition Following Brain Injury: Guidelines for Device and App Selection. *Perspectives on Neurophysiology & Neurogenic Speech & Language Disorders, 23*(2), 49-58 [69]
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Appendix 2

	Tier 2: Consultation with assistive technology organisations
*	AAATE. (2018). Excellence in the Process of AT Provision [11]. & AAATE. (2012). Service Delivery Systems for Assistive Technology in Europe: Position Paper [10]
*	Andrich, R., Gift, N., Mavrou, K., Roentgen, Daniels, R., Desideri, L., . . . de Witte, L. P. (2019). Towards a global quality framework for assistive technology service delivery. In Proceedings of the GReAT Consultation (pp. Page 263 – 269). Geneva: WHO [7]
*	ARATA. (2016) *Statement of Good Practice in Assistive Technology Provision in Australia [12]*
*	Brentnall, L., Mines, K., McGrath, K., Mines, R., Parasyn, C., & Walker, L. (2016). *National Guidelines on the Provision of Assistive Technology in Papua New Guinea* [26]
*	Connecticut State Department of Education. Connecticut Assistive Technology Guidelines - Section 1: For Ages 3-22 [32]
*	Dahlberg, R., Blomquist, U., Richter, A., & Lampel, A. (2014). The service delivery system for assistive technology in Sweden: Current situation and trends. *Technology and Disability, 26*(4), 191-197 [70]
*	Department of Health South Africa (2003). *Standardisation Of Provision Of Assistive Devices In South Africa: A Guideline For Use In The Public Sector* [25]
*	EnableNSW and Lifetime Care & Support Authority. (2011). *Guidelines for the prescription of a seated wheelchair or mobility scooter for people with a traumatic brain injury or spinal cord injury* [46] & Lukersmith, S., Radbron, L., & Hopman, K. (2013). Development of clinical guidelines for the prescription of a seated wheelchair or mobility scooter for people with traumatic brain injury or spinal cord injury. *Australian Occupational Therapy Journal, 60*(6), 378-386 [71]
*	Guideline for formulation of AP service plans (JAPAN) (personal communication from Prof. T. Inoue) [24]
*	iCare. (2021). *Guidance on the support pathway for people with a limb amputation* [72]
*	Michigan Region IV Assistive Technology Consortium. (2021). *Guidelines for the Provision of Quality Assistive Technology Services: A Plan for Michigan's Region IV* [34]
*	North Dakota Department of Public Instruction. (2015). *Guidelines for the Provision of Assistive Technology to Students with Disabilities under IDEA Part B* [33]
*	NSW Agency for Clinical Innovation. (2014). *State Spinal Cord Injury Service: Model of Care for Prevention and Integrated Management of Pressure Injuries in People with Spinal Cord Injury and Spina Bifida* [28]
*	RESNA. (2011). *RESNA Wheelchair* Service Provision Guide [47]
*	Van Der Heide, L. A., Roentgen, U. R., Van Der Pijl, D. J., & de Witte, L. P. (2017). How could the service delivery process of dynamic arm supports be optimized? *Technology and Disability, 29*(3), 101-108 [29]
*	WHO & UNICEF. (2022). *Global report on assistive technology* [6]
*	World Health Organisation. (2008). Guidelines on the provision of manual wheelchairs in less resourced settings [15]
*	World Health Organisation. (2017). *WHO Standards for Orthotics and Prosthetics* [17]

X	Canada: personal communication (Dr E. Smith) identified potential guidelines across the multiple jurisdictions of Canada, no capacity to secure these in the timeframe
X	Israel: Dr N Alyn identified potential guidelines in Hebrew; no capacity to secure and translate in timeframe
X	New Zealand: Ms C Williams and Ms D Wilson provided links to existing documentation regarding wheelchair guidance. Noted guideline writing currently underway (New Zealand Whaikaha - Ministry of Disabled People)
X	Taiwan Provision for AT services and options for assistive device subsidy (health, welfare, education) Personal communication Prof K Cheng

Appendix 3: Secondary screen of excluded articles for the term 'Quality'

Extracting additional articles with Quality in title	
*	Maximo, T., & Clift, L. (2015). Assessing service delivery systems for assistive technology in Brazil using HEART study quality indicators. *Technology and Disability, 27*, 161-170 [43]
*	de Witte, L., Steel, E., Gupta, S., Ramos, V. D., & Roentgen, U. (2018). Assistive technology provision: towards an international framework for assuring availability and accessibility of affordable high-quality assistive technology. *Disability and Rehabilitation: Assistive Technology, 13*(5), 467-472 [14]
*	Samant, D., Meera, M., Babirad, J., & Scherer, S.(2011). *A Quality Indicators Framework for effective AT service delivery* In G. J. Gelderblum et al (Eds.) *Everyday Technology for Independence and Care* (Vol. 29, pp. 245 - 253): Assistive Technology Research Series [48]
*	Desideri, L., Bizzarri, M., Bitelli, C., Roentgen, U., Gelderblom, G.-J., & de Witte, L. (2016). Implementing a routine outcome assessment procedure to evaluate the quality of assistive technology service delivery for children with physical or multiple disabilities: Perceived effectiveness, social cost, and user satisfaction. *Assistive Technology, 28*(1), 30-40 [44]
*	Dijcks, B. P. J., Wessels, R. D., de Vlieger, S. L. M., & Post, M. W. M. (2006). KWAZO, a new instrument to assess the quality of service delivery in assistive technology provision. *Disability and Rehabilitation, 28*(15), 909-914 [49]
*	Steel, E., Gelderblom, G., & De Witte, L. (2012). The Role of the International Classification of Functioning, Disability, and Health and Quality Criteria for Improving Assistive Technology Service Delivery in Europe. *Americal Journal of Physical Medicine and Rehabilitation, 91*((Suppl)), S55-61 [45]