Attachment 2

Appendix 4: Overview of the criteria identified in the included studies

study			patient orientation			interoperability/ collaboration	quality/core functions (of medication apps) available					
			privacy and security	consumer protection	user friendliness		reminder	self-monitoring	(medication) information	motivation to change behavior	medication/ patient safety	robustness
1	Ali et al.	2018	data protection regulations/ information on the use of user data (3)	information about the financial support of the app (6) information about the developer (name, contact information, references, conflicts of interests) (2) description of purpose and target group (5)	convenient data entry (auto-completion, text recognition, barcode) (2)	share medication lists and intake with third parties (care providers, family, caregivers) (1, 3, 4) reminders to third parties (4) alarm that informs third when dose missed (4)	adjust to complex medication schedules/ plan dose reductions (3) refill reminder (2) doctor appointment reminder (6) snooze (4)	adherence monitoring: recording of medication intake (1) medication list (2)	functions for better medication identification (2) medication information (1) disease-related information (3)		medication side effects/undesirable medication effects (1)	reminders without internet connection (1)
2	Carmody et al.	2019			personalization (9) appropriateness (4) complexity, navigation (1) design, layout, graphics, appealing look, visual information (3)				quality of the information (5) quantity of the information (6) credibility of the source (4)	entertainment (1) interests (2) interactivity (3) BCT catalog (inter alia linking behavior and health, consequences) (5)		
3	Dayer et al.	2013	privacy policy (3)	free (3)	multilingual (5) use of multiple profiles (6) online access to data (2) multiple platforms (8)	data synchronization/ export/printing (1) data input possible by provider (3)		monitoring of medication intake (1)	medication database (2)			reminders without internet connection (1) data storage in cloud (2)

#	Author	Year										
4	**Dayer et al.**	2017	- passwords (1) - privacy policy (3)	- free (3)	- multilingual (5) - considering different health competencies (4) - use of multiple profiles (6) - multiple platforms (8)	- data exporting/sharing (1) - refill by special pharmacy (7) - connect with other users (5)	- customizable reminder (3) - refill reminder (2) - snooze (4) - medication reminder (1)	- monitoring of medication intake (1)	- medication database (2)		- interaction with food and drugs (1)	- reminders without internet connection (1) - data storage in cloud (2)
5	**Grindrod et al.**	2014			- complexity/ integration of functions/ consistency (1) - technical support (10)							
6	**Grindrod et al.**	2017	- password protection (1) - privacy policy (3) - encryption/ private alarms (2)		- storage of personal health information (9)	- sharing data with third parties (3/4)						
7	**Haase et al.**	2017	- safety (2)			- synchronization (6) - sharing (1) - integration with medical record (2)	- refill reminder (2) - reminders (1)	- medication list (2) - logging (1)	- education (1)	- gamification (1)	- medication interactions (1)	
8	**Helden-brand et al.**	2016	- privacy policy (3) - password protection (1)	- free (3) - no advertising (4) - recent revision (1)	- simple language, precise information, meaningful headings (4) - easy start-up (1) - clearly legible representations, medication photos by the user (3) - multiple languages (5) - use of multiple profiles (6) - online data entry (2) - multiple platforms (8)	- data exporting/ sharing (1) - service provider can provide data/information (3) - submit refill requests (7) - networking with other users (5)	- medication specific reminders (1) - snooze/escalating reminders (4) - customizable reminders (3) - refill alerts (2)	- recording or medication use (1) - detailed anamnesis (3)	- medication database (2) - complex medication Instructions (1)	- incentives (4)	- identification of potential interactions (1)	- reminders without internet connection (1) - data storage in cloud (2)

No	Author	Year										
9	**Jupp et al.**	2018	- data security (2) - password protection (1)	- free (3) - no advertising (4) - recent revision (1) - accuracy of description/ objectives (5)	- available in both app stores (8) - use of multiple profiles (6) - multilingual (5) - time zone support (7) - personalization (9) - appropriateness (4) - handling/ navigation (1) - design, layout, graphics, attractive optics, visual info	- data export/printing (1) - notifications to other people (3/4)	- flexible scheduling (3) - snooze (4) - refill reminder (2) - customizable alert tones (5)	- storage of medication intake (1) - statistics/ tables on adherence (4)	- medication database (2) - quality of information (5) - quantity of information (6) - credibility of source (4) - evidence base (4)	- reward for Adherence (4) - entertainment (1) - interests (2) - Interactivity (3)		- reminders without internet connection (1)
10	**Kim et al.**	2018		- accuracy of description/ objectives (5)	- personalization (9) - appropriateness (4) - handling/ navigation (1) - design, layout, graphics, appealing looks, visual information (3)				- quality of the information (5) - quantity of the information (6) - credibility of the source (4) - evidence base (4)	- entertainment (1) - interests (2) - interactivity (3)		
11	**Liu et al.**	2016	- privacy (1)	- authorship (2) - attribution (5) - disclosure (6) - timeliness (1)	- user friendliness (11) - appropriateness (4)	- device linkage (6) - pharmacist advice (3) - social support (4)	- medication reminder (1)	- documentation of the medication (1)	- search for medications (2) - medication information (1)		- risk assessment (2)	
12	**Loy et al.**	2016	- privacy (1)		- user friendliness (11)			- monitoring (1) - medical record (3)	- medical information (1)		- identification of potential interactions (1) - dose calculation (3)	- reliability (3)
13	**Morrissey et al.**	2016							- BCT catalog (including planned consequences, reward and threat) (5)			

#	Author	Year										
14	**Nguyen et al.**	2016			- personalization (9) - appropriateness (4) - handling/ navigation (1) - design, layout, graphics, appealing looks (3)	sharing revenue records (1)	timed medication reminders (1)	- save medication names/dosage (2) - record medication intake and reasons for skipping (1)	- educational information about medication (1) - side effects of medication (1) - disease-specific information (3) - benefit of adherence (3) - risk of non-compliance (3)	- entertainment (1) - interests (2) - interactivity (3) - tracking progress (7) - medication goal setting (6) - encouraging intake logging (8) - encouraging problem solving of adherence barriers (9)		
15	**Park et al.**	2019	- backup/cloud (2)	- free (3)	- user friendliness (11) - use of multiple profiles (6) - multilingual (5)	- data export/printing (1)	- ingestion alarm (1) - refill reminder/ remaining stock indicator (2)	- recording of medication intake/storage of medication information (1)	- medication database (2) - complex medication instructions or notes (1)			- reminders without internet connection (1) - access via other end device/cloud (2)
16	**Santo et al.**	2016	- data security (2) - password protection (1)	- free (3) - no advertisement (4) - recent revision (1) - accuracy of description/ goals (5)	- available in both app stores (8) - use of multiple profiles (6) - multilingual (5) - time zone support (7) - personalization (9) - appropriateness (4) - handling/ navigation (1) - design, layout, graphics, attractive optics, visual info	- data exporting/sharing (1) - notifications for third parties (3/4)	- flexible scheduling (3) - snooze (4) - refill reminder (2) - customizable alert tones (5)	- storage of medication intake (1) - statistics/ tables on adherence (4)	- medication database (2) - quality of information (5) - quantity of information (6) - credibility of source (4) - evidence base (4)	- reward for adherence (4) - entertainment (1) - interests (2) - interactivity (3)		- reminders without internet connection (1)
17	**Tabi et al.**	2019	- data privacy (1) - data security (2)	- affiliation (2) - cost (3)	- multiple profiles (6) - multiple languages (5) - innovative data entry (2) - support with time zones (7) - user interface (3)	- sharing data with third parties (1/4) - communication with med. care providers (3) - synchronization with other devices (6)	- medication reminders (1) - personalized voice reminders (5)	- monitoring (symptoms, side effects, health data, vital information)/ correlations based on entered data (3)	- recognizing pills (2) - information about medication (1)	- goal setting (6) - journal (8)	- safety plan for acute emergency situation, emergency button (4) - warning when exceeding the safe dose (3) - interactions (1)	- reliability (3)

summary (criteria per category, (responses*/ all studies))	1) password protection (8/17) 2) data security (6/17) 3) privacy policy (5/17)	1) actuality (4/17) 2) author information (3/17) 3) free of charge (7/17) 4) ad-free (3/17) 5) app information (5/17) 6) funding (2/17)	1) handling complexity (7/17) 2) innovative data entry (4/17) 3) design/aids (7/17) 4) appropriate-ness (8/17) 5) multiple languages (7/17) 6) multiple profiles (7/17) 7) time zone support (3/17) 8) availability (Android, iOS) (5/17) 9) personaliza-tion (6/17) 10) technical support (1/17) 11) general user-friendliness (3/17)	1) data export/ sharing (10/17) 2) data transfer in ePA (1/17) 3) cooperation with med. care providers (8/17) 4) collaboration with social environment (6/17) 5) exchange with users (2/17) 6) synchronization (3/17) 7) automatic refill request (2/17)	1) reminder to take (7/17) 2) reminder to refill (7/17) 3) flexible scheduling of reminder (5/17) 4) escalating reminders/ snooze (5/17) 5) personaliza-tion (3/17) 6) reminder for doctor appointments (1/17)	1) recording of medication intake (11/17) 2) list of medications/ incl. dosage (3/17) 3) monitoring of health status (3/17) 4) statistics on adherence (2/17)	1) medication Information (8/17) 2) medication database/ medication identification (9/17) 3) disease Information/ adherence (2/17) 4) credibility of source (4/17) 5) quality of Information (4/17) 6) quantity of Information (4/17)	1) entertainment/ gamification (6/17) 2) interests (5/17) 3) interactivity (5/17) 4) incentives (3/17) 5) application of BCTs (2/17) 6) goal setting (2/17) 7) recording of progress (1/17) 8) encouraging logging (2/17) 9) problem solving regarding adherence barrier (1/17)	1) interactions/ side effects (6/17) 2) risk assessment (1/17) 3) dose calculation including warning (2/17) 4) emergency management (1/17)	1) reminders without internet connection (7/17) 2) data storage in cloud (4/17) 3) reliability (2/17)

* If several aspects in a study can be assigned to one criterion, the fulfillment of the criterion is only counted once, so that a maximum value of (17/17) can be achieved for each criterion.