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Communicating with patients through pictograms and pictures – a scoping review

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Abstract

Background

Communication between patients and Health Care Workers (HCW) may on occasion be challenged by disparities in cultural background, age and educational level. Written educational material is commonly used to reduce the risk of miscommunication. However, literacy among patients may also differ and it is therefore speculated that the use of pictograms may improve patients' understanding and adherence.

Objective

To evaluate the scientific literature and investigate the effect and practical utility of pictograms in medical settings with focus on dermatological patients.

Materials and methods

Pubmed, EMBASE, and Cochrane Library were searched July 2021 for studies regarding use of pictograms in medical settings and dermatology.

Results

The use of pictograms in dermatology is not well characterized, but studies in other fields of medicine report a positive effect of using pictograms in communication. Pictograms have a significant positive effect when presented alongside verbal or written explanations.

Conclusion

The quality of the development process is important to ensure the utility of any pictogram. Involving the target population in the design and validation of the pictograms may be critical. In the validation process, testing of transparency and translucency may benefit from international recommendations.

Introduction

Communication between Health Care Workers (HCW) and patients is a core element of clinical practice, as all consultations involve informing the patient. The general setting, personal characteristics of those involved, and many other challenging barriers are important factors to overcome for effective

communication. Studies focusing on communication barriers between HCW and patients are limited [1] but have identified obvious discrepancies between the target groups understanding and the complexities of written materials [2-4]. Much relies on the communication skills of the HCW, but the communication may also be challenged by several factors. Differences in age, sex, language comprehension, cultural background and educational level between both patient and HCW all constitute possible disruptors of communication between patient and HCW. [5,6]. Health literacy, a challenging factor for patients is defined as the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions [6]. Between 40-80 % of the verbal information conveyed during a medical consultation is forgotten immediately by patients and the need for strengthening communication becomes even more apparent [7-8]. In general, patients who communicate poorly seem to do so especially when communicating about health care issues [9-10]. This has practical consequences, as patients who lack understanding of treatment principles are less motivated to adhere to plans, resulting in suboptimal self-management and inappropriate use of prescribed drugs [11-12].

Patient education serves to improve a host of factors that influence the morbidity of patients. Patient education provides knowledge about the diseases, changes coping behavior, improves self-esteem and thereby positively influencing self-management and adherence. Patient education resources may consist of written material, courses, and rarely of a fully integrated package that spans time and educational methods followed by certification and quality assurance. Often, patients are simply provided with written material as this is expeditious, often sufficient,and easily documented. Sometimes, these materials may be an academic exercise, steeped in the HCW's education and far from the patient's reality. While more than two-thirds of physicians provide written patient education materials [13], the written information is often sub-optimal. Limitations include simple aspects such as small print and lengthy texts. Illustrations are commonly used to overcome similar problems in general communication and may be useful for health-related communication.

Pictograms facilitate health communication [14]. Pictograms refer to drawings, paintings or photographs containing figures and concepts representing words or phrases. Use of pictograms is associated with enhanced visual attention and better understanding and recall of information [15-17].

Skin diseases are visible for the eye and many are treated topically, albeit often with only poor adherence [18]. Visual aids, therefore, seem pertinent from an educational perspective. The aim of this review is to investigate the utility of pictograms for patient information in a dermatological or general clinical context. The research question to be answered was "which factors are necessary to make pictograms useful?"

Method

Scoping reviews serve to synthesize evidence and assess the scope of literature on a given topic. We therefore reviewed the literature following the five key steps [19]: (1) identifying the research question, (2) identifying relevant studies, (3) study selection (eligibility), (4) charting the data, and (5) collating, summarizing, and reporting the results (reference).

Primary aim

The primary aim of the scoping review was to investigate whether pictograms can be used as a communication tool to improve communication between HCW and patients.

Identifying relevant studies

We modified and followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) for scoping reviews guidelines [19]. PubMed, EmBase, and Cochrane Library were searched from July through end of August 2021 by using the following search terms: ("pictorial work", or "medical illustration" or "illustration" or "pictog", or "cartoon" or "picture" or "image" or "visual" or "nonlite" or "drawing"). This was then combined with AND ("eczema" or "dermatitis") (Supplementary Table 1). We subsequently also searched the reference lists of the included studies and review manuscripts.

The retrieved references from the database search were then screened by FBS for relevance based on title and abstract, and duplicates were removed. In case of any doubt regarding whether a study should be included, the full text version was required and investigated. The abstracts of the selected papers were then separately screened by FBS and KSI, and the full-text of the selected papers retrieved. Any disagreement regarding the inclusion of potentially relevant studies was resolved by a discussion between FBS and KSI. We used Rayyan Software version 2021, which is a free, online application to systematically do review and selection of the related literature (https://www.rayyan.ai/), assesses 1 July 2021).

Eligibility criteria

The full-text papers were independently reviewed by two of the authors (FBS & KSI) according to the inclusion criteria: 1) Original papers reporting data, 2) English language, 3) Investigating the use of any pictogram-based material in a medical and dermatological context, and 4) Including at least 10 participants. Studies were excluded if they did not report outcomes related to dermatology, medicine or health care.

Charting the Data

A data extraction template was created by FBS and piloted among all authors of this study. This was later refined and finalized based on data extracted from a sample of studies and on inspiration from other review studies investigating the same topic. Data was extricated from full texts as appropriate.

Data extraction, collating, summarizing, and reporting results

The following data were extracted: Type of study, number of studies, country, number of participants, study population and effect measurement (Table 1). Authors name and the date of publication, study setting country, study design, number of participants, study population, interventions , characterization of control group(s), effect measurement, conclusions (Supplementary Table 2), and authors name and the date of publication, purpose of pictogram, number of pictograms, type of pictograms and type of presentation (pictogram alone or with additional verbal or written information, counseling and or teach-back), form of presentation, and transcultural adaptation (Supplementary Table 3).

Results

A total of 10,837 articles were identified (Pubmed, n= 3263, EMBase n=6559 and Cochrane Library n= 1015). Of these, 7,611 were unique papers (figure 1). After screening the titles and abstracts of the articles, no studies investigating pictograms used in dermatology were found. Therefore, titles and abstracts were re-screened for pictograms used in other medical contexts, and 181 articles were read in full. Of these, 122 were excluded for reasons listed in the PRISMA scoping flow diagram (Figure 1). A total of 59 studies were included in the final analysis. All articles (n=59) included were published from 1997 to 2021. Geographically, 21 studies were conducted in North America, 15 studies in Africa, 11 studies in Asia, 10 studies in Europe, 1 study in Australia, and 1 study was an international study including Canada, USA, Netherlands, Spain, China, India and Australia (Table 1). The sample sizes ranged from 15 to 2719 participants in the studies. A total number of 12016 participants were included across all studies. Approximately half (31/59) of the studies were randomized, clinical trials. The non-randomized studies included cross-over studies, quasi-experimental design studies, follow-up-based studies, cross-sectional studies, case-controlled studies, interview-based studies, pilot studies, descriptive studies, and questionnaire-based studies (Table 1). Studies were conducted in primary and secondary healthcare settings. Further details about results and methods of the included studies are provided in Supplementary Tables 2 and 3.

Target populations

A broad range of age, clinical problems, treatment regimens and level of health literacy were observed across the studies. Three studies only included children (0-5-5 years old, 2-5 years old and 7,11 and 13 years old) while four other studies included patients ≥11 years old (one study), ≥12 years old (one study), ≥15

years old (one study), and ≥17 years old (one study). The rest of the studies included adults ≥18 years old (Supplementary Table 2).

Regarding health literacy, 21/59 (36%) studies included target populations exclusively of low literacy while the other studies did not have any limitations regarding the level of literacy. Based on cultural background, four studies included Xhosa respondents, which is one of the many cultural groups in South Africa, while one study included only foreign employees in Qatar and one study included patients with Latino background.

Pictograms in health care settings

Based on the most frequently studied medical treatments, nine studies included HIV- treatment, six studies included heart disease-treatment and three studies included asthma treatment. Other targeted therapies included two studies investigating treatment of diabetes type 2 and one study investigating cataract surgery, antibiotic treatment, replacement surgery, and functional dyspepsia.

Effect measurements

Various methods were used to measure the effect of pictograms (Table 1 and Supplementary Table 2). The most frequent effect measures included knowledge, adherence, level of understanding, and the ability of recalling. Other measures were readability, level of understanding, improvement of technique and compliance. Most of these factors were measured by using questionnaire and follow-up test.

Compliance (defined as the degree to which a patient correctly follows medical advices) was measured by pill count, diary to be completed daily, volumetric measurement of medicine left in bottles and by questionnaire. *Adherence* (defined as closely following a prescribed treatment regimen) was assessed by self-reporting and pill count, questions, electronic prescription monitors and exacerbations requiring emergency department care or hospital administration, questionnaire, death rate and attrition rate, and using medication possession ratio (MPR).

Dosing accuracy and *improvement of technique* were assessed by interview and direct observation. *Perception of utility, risk of false confidence, validation, disorders related symptoms, health-related quality of life and lifestyle change* were assessed by question, questionnaire and interview.

Design, presentation and validation of pictograms

All the included studies used either medication or symptom-based pictograms (Supplementary Table 2). Among the pictograms, fifty studies used locally developed pictograms, four studies used both locally and pictograms developed by the United States Pharmacopeia Convention (USP), three studies used pictograms developed by USP, and two studies used USP and pictograms developed by the international Pharmaceutical Federation (FIP). The number of pictograms ranged from two to one hundred ninety-three. However, some of the studies (n=17) did not describe the number of pictograms used. Pictograms were presented to the target population either as pictograms alone or pictograms combined with verbal and/or written information. (Supplementary Table 2). Thirteen studies presented pictograms alone, nine studies presented pictograms together with verbal information, twenty studies presented pictograms with written information, one study presented pictograms with motivational voice, and one study presented pictograms with counseling and teaching. Six studies were designed in more arms, where patients either received pictograms alone or with verbal information, five studies with both verbal and written information, one study with either written or verbal information, one study with both verbal and video-based information, one study either with written or both written and video information, and one study with written information and counseling (Supplementary Table 2).

 Among all studies, only thirty-four studies (57 %) tested the pictograms for comprehensibility before presentation to adapt the material to the target population. Standardized validation of pictograms *before* use on final target population, was reported in two studies [27,73] following recommendations from the International Organization for Standardization (ISO) and the American National Standards Institute (ANSI) [27,73]. Standardized validation of pictograms *after* use on final target population was reported in four studies following recommendations from ANSI [23,26,33,61], two studies following recommendations from ISO [72,73], two studies following recommendations from European Commission guidelines (ES) [27,39], and two studies following recommendations from both ANSI and ISO [30,59].

Discussion

The use of pictograms in healthcare settings has not been extensively studied. Based on this scoping review there are some key points to consider in the development and use of pictograms.

Design process

A systematic design process in which the target group is involved is strongly recommended. In the present review, the 32/34 studies, which pre-tested the pictograms reported a positive effect [20,23-25,27,29-31,34-39,41,45,49-50,56-57,60,62,64,67-71,73,75-76,78]. Many of the studies included in this review did not

involve the target population in the design process which may have decreased the efficacy of the pictograms. The general approach to information among low literacy persons may be generally different than those with high literacy level, and this should be addressed explicitly in the design process. Different personal interests may also influence how the target population perceives and responds to pictograms. In the included studies, most participants were included in the late stage of the design process, where they evaluated the almost fully developed pictograms. This is suboptimal as it limits a more active and targeted input and appears late in the dynamic design process, missing the window of opportunity for influence [79]. In the studies which used pre-testing, the description of the design process, materials, outcome of evaluations as well as the test population was limited.

Validation of pictograms

Two different concepts should be examined to validate the comprehension of pictograms transparency and translucency [80]. Transparency can be explained by "the guessability" of the meaning of a picture or image [81], and translucency is a measure of the strength of the relationship between a pictogram and its intended meaning. [35]. However, only 10 studies (17 %) followed the recommendations from ANSI, ISO or ES regarding the analysis of understanding of pictograms (transparency) [23,26,27,30,33,39,59,61,72,73,]. This issue is of particular concern. If validation is not considered during development of pictograms, there is a risk of misunderstanding the purpose as well as context of the pictograms. Ensuring that patients understand the meaning of pictograms enhance their ability to use them. In addition to that, many studies in this review provided an incomplete information of target population, outcomes and details validation process overall.

Cultural background influences how a target population receives and understands pictograms. Among studies using both USP and local pictograms, *Dowse et al*. [23] demonstrated preference for the local pictograms compared to those from USP, based on cultural influences. In another study, the same author concluded that only 5 USP pictograms out of total 50 pictograms met ANSI criterion defined as reaching a criterion of a least 85% correct respectively, in order to be considered, compared to 10 local pictograms [26]. Essentially, locally developed pictograms cannot be transferred to another population before considering differences between the populations [33]. In two studies, Indian and Portuguese participants concluded that USP pictograms reflect and speak western/US culture and not all of them were therefore correctly understood [42,59]. Added care should be considered, when using pictograms among cultural minorities, especially if there are developed in western culture.

Presentation of pictograms

The context in which pictograms are used is of importance; they can be presented with a verbal introduction or merely handed out to the target population. The studies investigating pictograms presented *along with verbal explanation* generally had better results in the intervention group [20,22,29,44,46,50,57,70]. Only one study could not find any difference in adherence when comparing patients who were given either pictorial aid intervention along with verbal information compared to a standard clinic visit [74]. Small sample size may have influenced the results. The use of pictograms along with *verbal and written information* was more effective [38,56,48,52,71] than   counseling alone. Pictograms improved recall of medication in 79% of intervention patients versus zero patients in the control group, but however participants in the intervention group were no more likely than those in the control group to correctly interpret the intended meaning of these pictograms, and the degree of improvement depended on the verbal explanation of the pictograms [48].

Based on the use of pictograms *either alone or with verbal explanation*, pictograms are best used as a communication aid in combination with verbal or text information. [26,47]. Most studies using pictograms with written information considered positive the use of pictograms compared to only written information. Pictorial labels supported by verbal instructions were better comprehended than labels with written plus verbal instructions [64]. V*erbal education with photographic education* was more effective than reading package or photograph-designed educational sheet [51]. Similarly, the combination of *video and written information* has greater effect on knowledge compared to the video tape alone [21]. In studies combining *verbal and video* [65] communication or *counseling and feedback* [40], pictograms appeared to be a useful addition. A study using a *motivational voice* alone [66] did however not report any positive effect.

 Age and health literacy level
During the development of pictograms, age and health literacy level must be considered [41,29,27]. Many of the studies in the current review were aimed to target participants with a low literacy level. However, only a few studies used validated standard tools for the assessment of health literacy. Most of the included studies used years of education as a proxy measure for literacy, however reading, comprehension, and numeracy are not always accurately reflected by years of education [81].

Limitations
Some of the included studies are old and of poor quality and therefore contribute very little. They have been included only to provide a more complete bibliography. Many of the studies recruited participants from the primary and secondary health care health sector. Thus, some participants may have had access to medical

information which may bias the results (recall bias). Differences in culture and geography among the studies may also affect the evaluations of outcomes in different ways. Finally, a limited number of key terms in the search string used for inclusion would also affect the results.

Conclusion

Pictograms are only poorly studied in a medical context. It nevertheless appears that they are most likely useful for improving communication between HCW and patients. Communicating medical information with images is better understood when supported by verbal or written explanations. Ensuring patients understand the meaning of the pictograms will enhance their ability to use these. Involving the target population in the design and validation of the pictograms may be critical. Designing pictograms may benefit by following international recommendations regarding validation, transparency, and translucency.

Declaration of interest:

Dr. Henning reported receiving grants from Leo Foundation. Dr Jemec reported receiving grants from AbbVie, LEO Foundation, Afyx, InflaRx, Janssen-Cilag, Novartis, UCB, CSL Behring, Regeneron, Sanofi, Boehringer Ingelheim, Union Therapeutics, and Toosonix and personal fees from Coloplast, Chemocentryx, LEO Pharma, Incyte, Kymera, and VielaBio. Dr. Ibler has been part of advisory boards and received personal fees from Astra Zeneca, Leo Pharma; Sanofi Genzymes and Eli Lilly. Dr Henning, Jemec and Ibler declare that none of the mentioned conflicts of interest had any influence to the content of this manuscript.

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Identification

Records identified from*:
Pubmed (n = 3263)
EmBase (n = 6559)
Cochrane (n = 1015)

Records removed *before screening*:
Duplicate records removed (n = 3016)
Records marked as ineligible by automation tools (n = 1828)
Records removed for other reasons (n = 3980)

Screening

Records after duplicates removed (n = 2244)

Records excluded** (n = 2063)

Eligibility

Full-text articles assessed for eligibility (n = 181)

Full-text articles excluded with reasons:
Not English (n =49)
Review or meta-analyses (n = 21)
No access (n =18)
Cohort <10 people (n = 34)

Included

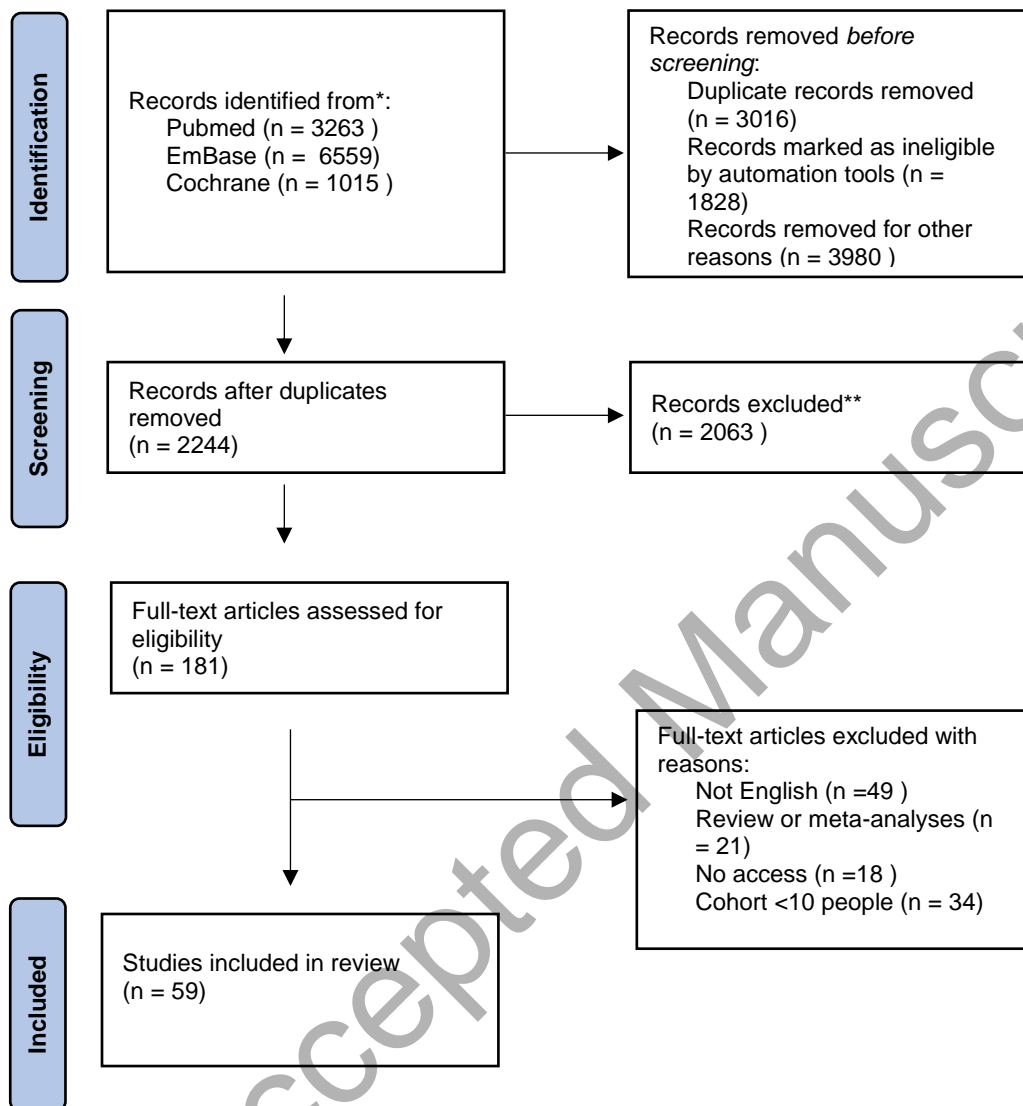Studies included in review (n = 59)

Accepted Manuscript

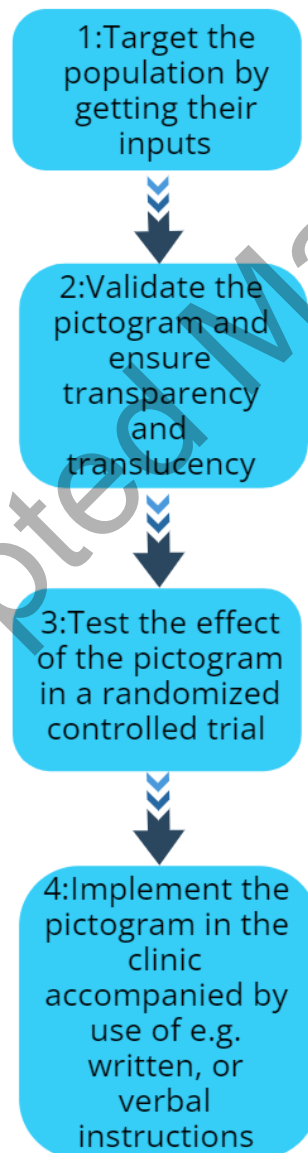Fig 1. Summary of the systemic searches and the processing of information for this review

Figure 2. Validation process for pictograms intended for clinical use.

Type of study	Number of studies	Study setting country	Number of participants	Study population	Effect measurement
Randomized	31	Nigeria[25], India[44,66], USA[35,36,38,40,49,52,56,62,65,70,74] Poland[75,78], UK[33], Jordan[71], Taiwan[51], Iran[57], Qatar[64], South Africa[27,31,34,37], Malaysia[60], Canada[43,48], Australian[21], Cameroon[20] and Belgium[67]	6045	1) Parents and caregivers seen at paediatric department. 2) Children with malaria, asthma and prescribed antibiotics. 3) Adults with HIV/AIDS, diabetes, hypertension, coronary heart disease, functional dyspepsia, and bronchial asthma. Adults with prescription of metoprolol, and seen at primary care practice, or who were under care of hip replacement surgery. Adults who were chronic	Compliance, adherence, health-related quality of life, patient satisfaction with pharmacy service, dosing accuracy, understanding level, medication knowledge and practice, the use of medication, inhaler techniques, evaluation, satisfaction, the effectiveness of the education programs, time to achieve target anticoagulant control, self-efficacy, comprehension, free recall of information and understanding, interpretation, and utility

				warfarin users. Foreign employee of Qatar. Participants who had no prior knowledge about methotrexate. Xhosa participants prescribed antibiotics. Female ambulatory patients. Community pharmacies	
Cross-over	1	USA[22]	21	Pupils from a remedial reading class	Recall
Controlled trial	1	Finland[28]	90	Finnish elementary school children	Understanding level
Quasi-experimental design	2	Egypt[58] and India[68]	331	Parent/ legal guarding presenting with their children at the pediatric outpatient clinic, and hemodialysis patients	Effectiveness on reducing caregivers and readability
Follow-up	2	India[47] and Canada[61]	217	Patients attending the outpatient departmen	Understanding level, evaluation and validation

				t, and patients with type 2 diabetes	
Cross-sectional	5	Taiwan[41], Cameroon[53], and Portugal[59,72]	1520	Patients seen in a medical clinic, adults selected from the waiting rooms, adults after hip replacement surgery, pharmacies clients and cultural minority included Hindu living in Lisbon	Comprehension and preference acceptability, understanding and legibility of pictograms
Case-controlled	2	India[42] and Malta[50]	180	Adults seen at hospital and patients who underwent coronary artery bypass or heart valve surgery	Interpretation, adherence and lifestyle changes
Interview-based	6	South Africa[26,45,76,77] Poland[73] Canada[46], and Netherlands[69]	619	Xhosa community, HIV/AIDS South African, community members and healthcare providers, asthma patients,	Interpretation, evaluation, effect measurement, technique, risk of false confidence

				patients seen in public primary health care facilities and pharmacy clients	
Pilot	4	USA[29,32,55,63]	97	Patients seen at internal medicine clinic, HIV-positive men and women, adults after hip replacement and adults who presented to the VA outpatient heart failure clinic, with congestive heart failure and cognitive impairment	Heart failure related knowledge, self-care behavior, heart-failure related symptoms, adherence, acceptability and comprehension
Descriptive	1	USA[24]	21	Adult clients of an inner city job training program	Recall
Questionnaire- based	4	South Africa[23,30] Tanzania [39] and an international study included Asia, North America, Australia and Europe[54]	2875	Xhosa group, Tanzanian participants and voluntary young people around the	Evaluation, acceptance, understanding, readability, acceptability and convey of information

				world	

Table 1. Characteristics of included studies

Study investigated only low health-literacy population: 23,24,26,27,29,30,31,32,34,41,43,44,45,47,55,56,57,62,64,70,76