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Inpatients' information needs about medication: A narrative systematic literature review

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A B S T R A C T

Objective: To provide an overview of inpatients' information needs about medication, including the best moment to provide this information, how, by whom and what patient characteristics influence these needs.
Methods: A systematic literature review was conducted. Studies that reported the information needs from inpatients about medication were included from Medline and Embase. The Crowe critical appraisal tool (CCAT) was used to assess the quality of the studies.
Results: Initially, 710 records were retrieved from Medline and Embase. After the forward search, another 609 records were screened and in total, 26 articles were included. The CCAT scores ranged from 17 to 34 points on a 40 point scale and two articles received 0 points.
Conclusion: Inpatients main needs about medicine information are information about adverse and beneficial effects of medication, and general rules about how to take medication. Preferably, this information is printed and provided at the time of prescribing by a physician that already has a relationship with the patient. The most recent studies show that patients are open to the use of modern technology.
Practice implications: This review provides a starting point for providing medicine information to inpatients. Further research should focus on patient characteristics influencing these information needs.

1. Introduction

Patients often receive new medication or experience medication alterations during hospital admission [1]. To achieve optimal outcomes in terms of effect and safety of pharmaceutical treatment, it is important that medication is used as prescribed. During hospital admission, patients need information to help them decide whether to take a medicine and information to help them use the medicine safely and effectively once home. In order to achieve these goals, patients need to be informed about changes in pharmacotherapy and the medication they use. The information need is defined by Ormandy [2] as 'Information need is a recognition that your knowledge is inadequate to satisfy a goal that you have, within the context/situation that you find yourself at a specific point in the time'. This indicates that the medicine information need is not a rigid set of topics about medication and that the information needs

cannot be determined on forehand by health care professionals.

Literature shows that meeting the patients information needs can increase treatment goals in terms of patient satisfaction [3] and supports shared decision making [4]. Also, well informed patients have a higher adherence with drug treatment programs [5–7]. Provision of information about medicines is one of the interventions than can be implemented to improve safe and effective medicine use [8]. Although these studies are published 15–20 years ago, we believe these finding are still applicable to current clinical practice, since information providing has not been substantially changed in most hospitals.

Discharged patients often lack knowledge about their medication [9]. Also, inpatients are often not satisfied with the provided information [10,11]. Beside, most of the existing information leaflets do not meet outpatients' needs [12] and appear to be ineffective on several occasions, for both in- and outpatients [13–15]. Current research

predominantly focusses on the effect of providing medicine information on outcomes such as patients' medicine knowledge or their drug adherence [7,14,16], but information about the patients information needs is lacking. Kusch et al. [17] performed a review of patients individual needs for drug information, but this was not specified to the information needs of the admitted patient.

Although meeting information needs has beneficial effects on patients satisfaction and adherence, it is unknown what inpatients' medication information needs are. Therefore, the objective is to provide an overview of the available evidence regarding inpatients information needs about medication during hospital admission. The aim is to answer the following questions: What are information needs on medication of inpatients? What is the best time to provide this information, how and by whom? And are these preferences dependent on patient characteristics?

2. Methods

This systematic review was conducted in accordance with the recommendations by the preferred reporting items for systematic reviews and meta-analysis (PRISMA) guideline [18].

2.1. Eligibility criteria

Published, peer reviewed studies that reported the information needs from patients about medication, during hospital admission, were included. Appropriate study settings included hospital environments or inpatients settings and patients of all ages. Only original full text articles, written in English, published from 1996, were eligible for inclusion. A time period of 25 years was chosen because a explorative search from the last 10 years did provide little information about medicine information needs for clinical patients. Although healthcare has changed the last 25 years, especially when it comes to modern technology, we believe that the main needs about medicine information are little influenced by the factor time. All study designs, except for review articles, and all lengths of follow up were included.

2.2. Search strategy

The search strategy was set up by the authors and optimized by a medical librarian. Medline and Embase were searched with the following search strategies:

2.3. Medline (searched on 18–07-2022)

(Inpatients[mesh] OR inpatient*[tiab] OR in-patient*[tiab] OR hospitalized-patient*[tiab]) OR admitted patient* [tiab] AND (drug-Information*[tiab] OR medication-inform* OR Patient medication knowledge[mesh] OR Patient-medication-knowledge*[tiab] OR medication-education*[tiab] OR Patient medication knowledge [mesh]).

2.4. Embase (searched on 26–07-2022)

('hospital patient'/mj/exp OR inpatient*:ti,kw OR (((hospital OR hospitalized OR hospitalised OR admitted) NEXT/2 patient*):ti,kw)) AND ('drug information'/mj OR 'patient education'/mj OR (((drug OR medication*) NEAR/3 (information* OR education*)):ti,kw) OR ((patient* NEAR/3 (education OR knowledge)):ti,kw)) NOT ([conference abstract]/lim OR [conference review]/lim) AND [english]/lim AND [1997–2022]/py.

In addition, the reference lists of the included articles were manually searched to identify additional relevant articles that were not identified through the database search. For the included articles, a forward citation search was conducted in December 2022 (**see S1**). For the forward citation search, the citations of the included articles were tracked to investigate if the included articles were cited in other relevant articles.

2.5. Selection process

Potential relevant studies were screened by title and abstract by one reviewer (SW). The excluded studies were screened by another reviewer (HvdS), in case of a discrepancy the article was included in the full-text screening. Full-text screening for inclusion was conducted independently by two reviewers (SW and RZ) and any discrepancies were resolved via discussion (SW, RZ and HvdS). The reviewers recorded reasons for article exclusion. Endnote (version 20) was used to remove duplicates and to organize the reference list.

Two types of studies were included. The first category included studies in which patients were asked for their medicine information needs, referred to as category P (patient). The second category included studies in which patient satisfaction was measured after implementation of an intervention involving provision of information about medicines, referred to as category I (evaluation of an intervention). We choose to create these two categories because other results can be expected when patients were asked for their intrinsic information needs versus the measurement of patient satisfaction with an implemented information provision structure.

2.6. Data items

The included articles were searched for outcomes about the type of medicine information needs, the preferred moment for receiving this information, the preferred method for providing information about medication, the preferred provider of the medicine information, and possible patient characteristics influencing these medicine information needs.

2.7. Quality assessment

The Crowe critical appraisal tool (CCAT) [19–21] was used to assess the quality of the included studies. This tool is divided into eight categories and 22 items. Each item has multiple item descriptors to appraise and score a category. Each category receives its own score on a 6 point scale from 0 to 5. The lowest score for each category is 0, and 5 is the highest score. Two reviewers (SW and EvdS) assessed each study independently. Afterwards the CCAT scores were discussed by the reviewers until consensus about the scores was reached.

3. Results

Initially, 710 records were retrieved from Medline and Embase. After the forward citation search, another 609 records were screened. In total, 26 articles were included in the systematic literature review (see Fig. 1). An overview of the characteristics of the included studies is displayed in Table 1. Thirteen studies had a cross sectional observational study design, seven studies were qualitative studies using interviews or a focus group, two studies were non-randomized trials and four studies were randomized clinical trials. Patients with cardiac conditions or patients using antithrombotic drugs were investigated in seven studies. Six studies included psychiatric patients. No studies regarding the medicine information needs from children or their caregivers could be included. The majority of the studies were conducted in Europe (38%), followed by North America (35%), Oceania (19%) and Asia (8%). In nine studies, the primary outcomes did not provide information that was needed for our literature review [22–30], but the results did provide answers to our specific research questions.

Studies that evaluated an intervention often lacked a control group [25,26,29,31–35].

Table 2 provides an overview of conclusions about the topics of interest, retrieved from the included studies.
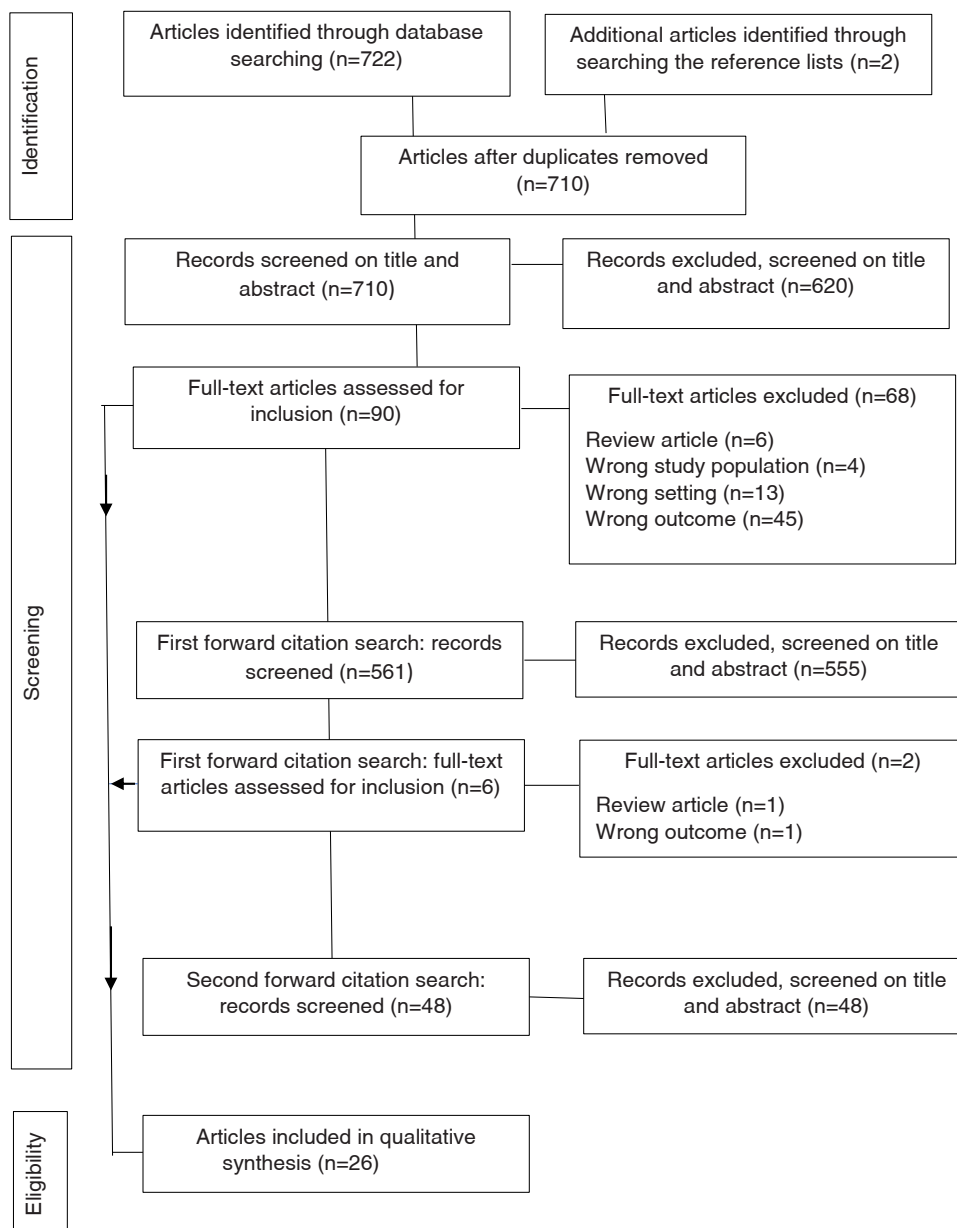
Fig. 1. Inclusion flow diagram.

3.1. The type of medication information needed

Fourteen studies provided information about the preferred type of medicine information, nine studies in category P and five in category I. In 11 studies, patients were interested in information about the side effects and the potential problems associated with the medicines, this was mentioned in both categories [23,29,30,36–43]. Also the beneficial effect of medication and reason for starting the medication was considered important information, this was mentioned in seven studies, predominantly in category P [23,30,37,41,42,44,45]. Patients also wanted to receive general information on how to take medication [23, 30,40,44,45]. This was mentioned in both categories. Patients desired less often information about drug-drug interactions [39], contra indications [41], mode of action [30,44], how to dispose unused medication [29], the duration of therapy [35], the addictive character and the way to taper or stop medication [22]. The topic 'storage of medication' was considered less usefull [41]. Chan et al. [44] describe that patients wanted to receive information that facilitates their decision-making and self-management of their health.

3.2. Moment of receiving information

Three studies provided information about the best moment to provide medicine information during hospital admission. Two studies were in category P and one in category I. Patients wanted to receive the information before starting the medicine, even when they were being unwell, because this gave them time to process the information [44]. Sheed et al. [37] also found that patients wanted to be informed before starting pharmacotherapy, although some patients acknowledged they may have reduced capacity to comprehend this information when they are acutely unwell. There was also a need for follow-up information or reminders during the course of treatment. Both these results were found in category P. A small group of patients (in studies of category I) reported that they wished to be informed at the time of administration of the medication [43].

3.3. Information provider

The preferred provider of medicine information was mentioned in six

Table 1

An overview of the included studies.

First author and year of publication	Study design and data collection	Study population and study setting	Sample size	Aim of the study
Studies in which patients were asked for their medicine information needs				
Chan[44], 2020	A descriptive exploratory approach using semi-structured interviews	Adult patients admitted to the general ward in New Zealand	30 patients	To determine the medicines information needs of patients admitted to the general medical service of a large New Zealand hospital, and identify the barriers and enablers to meeting these needs.
Cooper[39], 2014	A cross sectional study using surveys. Patients self-completed the adapted Picker Patient Experience Questionnaire.	Adult patients in Australia.	295 patients	To identify and evaluate patients' experiences and expectations relating to education about medications during an in-patient stay.
Desplenter[41], 2012	A qualitative study using semi-structured interviews.	Adult psychiatric patients in Belgium.	16 patients	To gain knowledge on the opinion of psychiatric patients about provision of drug information so that opportunities for the psychiatric hospital pharmacist as a member of the staff communicating with patients can be considered.
Galdeano[23], 2014	Methodological research design	Adult cardiology patients in Portugal	200 patients	To perform the semantic validation and to evaluate the reliability and the presence of ceiling and floor effects of the Cardiac Patients Learning Needs Inventory in Portuguese patients with coronary artery disease.
Hätönen[42], 2008	An explorative study with a mixed method design. Interviews with structured and semi structured questions were conducted.	Adult psychiatric patients in Finland	51 patients	To explore patients' experiences of patient education on psychiatric inpatient wards.
Ong[45], 2018	A cross-sectional, descriptive correlational study design, with a questionnaire survey.	Adult patients with heart failure in Singapore.	97 patients	To investigate the learning needs of hospitalized Singaporean patients with HF
Richler[27], 2019	A qualitative descriptive study involving semi-structured interviews	Homeless patients admitted to the internal ward in Canada.	12 patients	To characterize the perceptions, attitudes, and beliefs about prescribed medications held by hospitalized patients who are homeless
Sheed[37], 2022	A qualitative descriptive study using semi-structured interviews and a focus group	Adult, psychiatric patients in New Zealand.	30 patients, 26 individual interviews and 1 focus group with 4 patients.	To explore the medicines information needs of mental health service users.
Trewin[47], 2003	A quantitative evaluation via personal interviews using a questionnaire.	Inpatients admitted to the respiratory ward in the United Kingdom.	101 patients	To determine patients' preferred sources of drug information and their attitudes to how this is provided.
Vrhovac[30], 2000	A cross sectional study with a questionnaire.	Adult patients from the wards cardiology, hematology, gastroenterology and nephrology in Croatia.	183 patients	To investigate knowledge of medical inpatients, stratified in groups according to different characteristics, on drugs taken before admission to the hospital and drugs taken during hospitalization
Zwaenepoel [35], 2006	A cross sectional study with standardized interviews	Adult psychiatric patients, in Belgium.	39 patients	To investigate the "extent of information desired'' (EID)-scale through a behavioral approach. Do patients with high EID-scores show information seeking behavior? Are EID-scores confounded by socially desirable behavior? A secondary goal was to evaluate patient information leaflets about psychotropic drugs.
Studies in which patient satisfaction was measured after implementation of an intervention involving medicine education				
Angunawela [46], 1998	A randomized controlled trial. The controls received advice in the usual way, commonly oral with or without written information. Patients in the intervention group received, in addition to the usual information, patient information leaflets.	Adult inpatients on the general psychiatry ward in the United Kingdom.	124 patients	To evaluate the impact of drug information leaflets for mentally ill patients on knowledge and satisfaction concerning psychotropic drug therapy.
Auyeung[38], 2011	A cross sectional study. Patient satisfaction with medicines information was assessed using the validated Satisfaction with information about medicines scale.	Adult patients with cardiac related conditions in the United Kingdom.	140 patients	To explore the satisfaction of cardiac in-patients regarding the information they received about their medicines, and the role perceptions and practices of practitioners whose responsibility it was to provide such information.
Desplenter[22], 2009	A cross sectional survey with a self-completed structured questionnaire	Adult psychiatric patients in Belgium.	96 patients	To evaluate a patient pamphlet on selective serotonin reuptake inhibitors (SSRIs) by calculating Flesch-Douma readability scores and by applying the Consumer Information Rating Form to Flemish inpatients with major depression taking SSRIs.
Haut[24], 2018	A nonrandomized controlled, pre-intervention-post-intervention comparison trial. Patients in the intervention group received a patient-centered education bundle. The control group recieved regular care.	Adult patients on medical and surgical nursing units in the United States.	19652 patients	To evaluate a real-time, targeted, patient-centered education bundle intervention to reduce nonadministration of VTE prophylaxis.
Kim[33], 2015	A prospective quality improvement project. A hospital pharmacists used a warfarin educational video on the iPad to educate	Adult, hospitalized patients using warfarin in an academic	40 patients	To determine if an iPad is an effective tool to deliver video educational content about warfarin to hospitalized patients and to evaluate patients'

Table 1 (*continued*)

First author and year of publication	Study design and data collection	Study population and study setting	Sample size	Aim of the study
	patients who would normally be informed through traditional verbal and written methods. Each patient answered a satisfaction survey.	medical center in the United States of America.		satisfaction with the use of an iPad to learn about warfarin.
Le Sage[43], 2008	A quantitative, cross-sectional survey design	Adult patients on a LMWH in Canada.	48 patients	To investigate patient awareness and knowledge of thromboprophylaxis, as well as patient satisfaction with thromboprophylaxis.
Magee[25], 2021	A prospective cohort study using a questionnaire.	Adult, diabetic patients in the United States	43 patients	To apply human factors and education principles to refine and optimize an inpatient DSSE program, D2Go –Inpatient, for patient and provider usability; to use implementation science to inform the design of implementation processes for program delivery within nursing unit workflow; to establish a D2Go program toolkit; and to evaluate the feasibility and preliminary impact of the program when delivered by nursing unit staff on medical/surgical units.
Marini[31], 2014	A randomized controlled trial. The control group received standard VTE education, the intervention group watched an educational video, in addition to the standard education.	Adult patients receiving VTE prophylaxis in the United States.	56 patients	To investigate the impact of a brief educational video on patient knowledge, satisfaction, prophylaxis rates, and compliance.
Nickles[32], 2019	A quality improvement project that used the Model for Improvement and the Plan-Do-Study-Act method. Patient satisfaction was measured with the one minute evaluation.	Geriatric inpatients in the United States.	55 patients	Specific aim 1: increase nursing students use of teach-back from the current state of 0–80% of their patient encounters; Specific aim 2: ensure that 80% of the patients approached can state the name, purpose and side effects of their current medications; Specific aim 3: have 80% of the patients satisfied with their medication teaching
O'Leary[26], 2016	A controlled trial with structured interviews. The control group received regular care and the intervention group received tablet computers with a mobile patient portal.	Adult patient in the United States.	202 patients	To assess the effect of tablet computers with a mobile patient portal application on hospitalized patients' knowledge and activation.
Shen[34], 2006	A qualitative study using a satisfaction survey. Participating patients received individual training for approximately half an hour each day over 3–5 consecutive days.	Geriatric inpatients in Australia.	60 patients	To assess the impact of a nursing-staff-initiated in-hospital medication education program for elderly patients in terms of increasing medication knowledge and adherence to a medication regimen after discharge from the hospital. In addition, the impact of cognitive status was considered, and patients with a lower MMSE score (20–24) were compared with those with a higher MMSE score (25–30).
Superior[29], 2002	A cross sectional study with a satisfaction survey.	Adult Inpatients in the United States.	30 patients	To develop an educational videotape for adult patients about general medication-use guidelines. A secondary objective was to evaluate the effectiveness of the videotape in increasing patient knowledge about medications and their proper use.
Sze[36], 2020	A cross-sectional study. Patients satisfaction was assessed using the satisfaction with information about medicines scale.	Adult inpatients in a hospital in the United Kingdom	71 patients	To find out inpatients' satisfaction towards information about medicines provided during inpatient stay.
Young[51] 2021	A prospective randomized controlled study comparing pharmacist-facilitated e-learning with standard pharmacist-delivered face-to-face education satisfaction with warfarin education.	Adult patients (or their carers) who had been prescribed warfarin in Australia.	54 patients	To compare the effect of pharmacist-facilitated interactive e-learning versus pharmacist-delivered face-to-face education (standard care) on patients' or their unpaid carers' knowledge of warfarin. Secondary objectives were to compare the participants' satisfaction with warfarin education as well as the amount of time spent by the pharmacist in delivering warfarin education, and to assess the preferences that pharmacists have in terms of the delivery mode for warfarin education.
Zhao[52], 2019	A randomized controlled trial. Patients in the control group were educated using traditional patient education methods, namely, oral education combined with promotional materials. The experimental group was first educated using audio recordings, followed by face-to-face question-and-answer sessions.	Adult patients in the department of respiratory medicine in China	713 patients	To (a) assess the feasibility of implementing an audio-based educational intervention for hospitalized patients in respiratory ward, (b) assess the impact of the audio on asthma patients' knowledge, and (c) assess the satisfaction of patients with their education.

Abbreviations
D2Go Diabetes to Go
DSSE Diabetes survival skills education
EID Extent of Information Desired
HF Heart Failure

LMWH Low Molecular Weight Heparin
MMSE Mini-Mental State Examination
SSRIs Selective serotonin reuptake inhibitors
VTE Venous Thromboembolism

studies, four times in category P and two times in category I. Patients predominantly wanted to receive information from the physician, stated in five of these studies. The nursing staff (5 out of 6) and the pharmacist (4 out of 6) were also mentioned often. The physician was mentioned as the first choice information provider, since the physician has the total picture of the patient and knows why the medication has been started [41]. Patients wanted to receive information from health care providers with whom they have a good relationship [37,44]. In one study, patients had the preference for receiving information from a person of the same cultural background [44]. No differences were found in the results between category P and I.

3.4. Way of communication

Eighteen studies provided information about the preferred way to receive medicine information. Five in category P and thirteen in category I. Patients were open to a wide variety of communication methods, and these preferences varied per patient. Most often patients mentioned printed information as the preferred way for communication, since they had the opportunity to review printed medicine information at any time. Printed information has also the advantage that it can be shared with others, for example their family or caregivers. Besides this, communication via modern technology, such as a smart phone or iPad, and verbal communication was mentioned as a preferred way of communication. Often a combination of communication methods was desirable. The preference for printed information was predominantly found in studies in category P. Studies in category I showed that patients were satisfied with a variety of communication methods, for example printed, verbal, video or by using a tablet. The most recent studies, with a publication date from 2017, show that patients are open to different types of communication. Printed information, verbal communication and the use of modern technology, for example the use of eLearning or use of an Ipad, were all considered suitable.

3.5. Patient characteristics influencing medicine information needs

Five studies, two in category P and three in category I, provided information about patient characteristics that may have influenced patients medicine information needs. Cultural background and ethnicity influenced the type of information they preferred. This was mentioned in both categories. For example, it is relevant for Muslims to know whether medication contains alcohol or to receive information about alternative dosing during the fasting period [37]. Patients of white or mixed white and black ethnicity were less satisfied than other ethnic groups of information regarding the impact of medication on sex life. Black or black British were more likely to be satisfied towards information on unwanted medication side effects compared with other ethnic groups [36]. Results about the influence of age and education level on the information needs were conflicting. Some studies found no influence of age [45] or educational level [33,45] on the learnings needs about medication. However, Sze et al. [36] found that patients aged 45–64 were more likely to be satisfied with information on 'how the medicines work' than the 65 and above as well as the 18–44 age group. Patients who attended secondary school and below were more likely to be satisfied than those attending college and above. These conflicting results were found in both categories. Younger patients and females liked using the iPad more than other patients [33]. Cardiac patients often preferred to receive information about the general rules about how to take medication, why they should take the medication and side effects [23,45]. Five studies with psychiatric patients [22,35,37,41,42] found that patient predominantly wanted to receive information about the

beneficial and adverse effects. On the other topics, too few studies were included to draw conclusion on a comparison between these two groups.

3.6. Quality of the studies

The quality of the included studied was measured using the CCAT. The results are shown in Table 3. Two studies had a CCAT score of zero, since the questionnaire could not be completed. In one study the tables were blurred and results unreadable [46]. The other study described a quality improvement project and was not focused on scientific research [29]. The CCAT scores ranged from 17 to 34 points on a 40 point scale. The older studies were given the lowest CCAT scores [30,47].

3.7. Comparison of the studies from category P and I

Except for the preferred way of communication, no relevant differences were found between studies that asked patients for their information needs versus studies that evaluated interventions on the provision of information about medicines. In the P studies patients most often wanted to receive printed information. The I studies show that printed information can be combined with modern technology resulting in patients' satisfaction. The studies with the lowest CCAT scores were in the I category. The CCAT scores in the P category varied from 17 to 30 points, with an average of 24.8 points. The CCAT scores in the I category varied from 0 to 34 points, with an average of 26 points after excluding the two studies with zero points.

4. Discussion and conclusion

4.1. Discussion

This systematic literature review shows that inpatients wanted to receive information about adverse effects and the potential problems associated with the medicines. Also the beneficial effect of medication and reason for starting the medication was considered important. Besides this, patients main needs were information about general rules on how to take the medication. Preferably, this information is provided at the time of prescribing by a physician that already has an relationship with the patient. Patients are open to a wide variety of communication methods. When patients are asked for the preferred way of communication printed information is most often mentioned, whether or not combined with verbal information. However the implementation studies show that printed information can be combined with modern technology resulting in patients' satisfaction. Cultural background and ethnicity influenced the type of information desired. Except for the preferred way of communication we found no relevant differences between studies that asked patients for their information needs versus studies that evaluated interventions on the provision of information about medicines.

Our results are in line with those of previous studies [12,17]. Kusch et al. [17] performed a scoping review of patients individual needs for drug information, not specified to the information needs of the admitted patient. They found that information about adverse drug reactions and treatment options was considered important. Information about drug-drug interactions was mentioned as second most important topic, something we did not found in our review. Similar to our findings, Raynor et al. [12] showed that patients appreciated printed information that contained a balance of harms and benefits and that most patients wanted to know which adverse effects could arise. Patients required also information to help decision-making about whether to take a medicine or not. However, Raynor et al. [12] studied printed information provided in all health care settings, and did not focus on the preferences of

Table 2
Medicine information needs.

First author and year of publication	Preferred type of information	Preferred moment of receiving information	Preferred information provider	Preferred way of communication	Patient characteristics influencing medicine information needs
Studies in which patients were asked for their medicine information needs					
Chan[44], 2020	Patients desired information to facilitate their decision-making and self-management of their health. Participants wanted a variety of different medicines information ranging from basic information such as doses, to an in-depth description of mechanisms of actions. Specifically, participants wanted to know what they were being treated for and the effects of the medication.	The time of prescribing. Participants wanted the information prior to taking the medicine because it gave them time to process the information and understand it. While being unwell, participants still wanted to be given information, but acknowledged that follow up, or providing information in writing would be required to ensure retention and understanding.	Most patients also preferred to receive medicines information directly from the prescriber, with some referring to nurse specialists specifically. Pharmacists were the second most commonly quoted preferred provider of medicines information	Written information enables patients to understand their medicines and therefore promotes autonomy. Many were concerned about forgetting, especially if a lot of information was given at once, or if they needed to communicate the information to someone else. Participants believed written information enabled efficient transfer of information. Having opportunities to review and re-visit medicines information was also important, this was done by asking questions to the HCP.	Not applicable.
Cooper[39], 2014	A desire to know more about side effects and interactions	Not applicable.	45% preferred the doctor, 33% indicated a pharmacist and 22% indicated a nurse.	Not applicable.	Not applicable.
Desplenter [41], 2012	The information in the pamphlet was rated as useful and had been provided in a sufficient amount; but the topic 'storage' was found to be somewhat less useful than the topics benefits of the medication, contraindications, directions, precautions and adverse effects.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Galdeano[23], 2014	Percentage of patients who considered the following information import or very important: General rules about taking medication 86%, why I am taking each of my medications 87,5%, side effects: 84%, what to do if I have problems with my medication: 93,5%.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Hätönen[42], 2008	The information area's about the effects of medication (92%) and side effects of medication (90%) were considered as important.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Ong[45], 2018	Within the top ten most important topics two topics about medication were listed: general rules about taking medication and why I am taking each medication. No topics about medication were in the 10 least important topics.	Not applicable.	Not applicable.	Not applicable.	Age, educational level, monthly household income, duration of the disease, severity of the disease, smoking status or admission frequency did not influence the learning needs about medication.
Richler[27], 2019	Not applicable.	Not applicable.	Not applicable.	Patients commonly described a desire to use technology, including smartphones, to facilitate medication education. Also group education sessions were recommended.	Not applicable.
Sheed[37], 2022	Patients wanted information about adverse and beneficial effects of their medicines	Most participants wanted information provided	Preferred information providers ranged from their psychiatrist or general practitioner to their nurse, pharmacist or peer-support worker. Some patients	Most patients wanted verbal information to supplement written.	Cultural background, including religion and ethnicity appeared to influence the type of information desired.

Table 2 (*continued*)

First author and year of publication	Preferred type of information	Preferred moment of receiving information	Preferred information provider	Preferred way of communication	Patient characteristics influencing medicine information needs
		before starting the medicine, although some acknowledged they may have reduced capacity to comprehend this information when acutely unwell. Follow-up information or reminders during the course of treatment were also emphasized as necessary	had a preference for receiving information from a person of the same cultural background.		
Trewin[47], 2003	Not applicable.	Not applicable.	Preferred source of drug information was: doctor (35%), pharmacist (11%) and nurse 4%.	Almost all patients confirmed they liked to be given printed information about their medication.	Not applicable.
Vrhovac[30], 2000	Drug dosage was rated as the most important 3.62, on a 1–5 scale, indication 3.57, precautions 3.41, side effects 3,16 and mode of action 2.08	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Zwaenepoel [35], 2006	More concrete information about posology and duration of therapy.	Not applicable.	Not applicable.	The evaluation of the leaflets was generally positive.	Not applicable.
Studies in which patient satisfaction was measured after implementation of an intervention involving medicine education					
Angunawela [46], 1998	Not applicable.	Not applicable.	Not applicable.	While patient satisfaction was higher in the leaflet groups (73% vs. 60%), this increase was not statistically significant p = 0.13.	Not applicable.
Auyeung[38], 2011	Patients were significantly more satisfied with information they received about the action and usage of medicines compared to the potential problems with medicines. The average score for Action and Usage was 7.63 (1.93) [out of 9] and for Potential Problems was 5.10 (2.65) [out of 8]. Patients reported the highest satisfaction with the following topics: how to use the medicine (95%), what the medicine is for (93%) and what the medicine is called (91%). Patients reported the lowest satisfaction with the following topics: whether the medicine will affect your sex life (57%), what are the risks of getting side effects (58%) and what you should do if you experience side effects (60%).	Not applicable.	Patients were satisfied with the amount of information from pharmacists (95%), nurses (90%), and doctors (78%).	Not applicable.	Patients satisfied with the amount of information provided by health care professionals had significantly higher total satisfaction scores compared to those reporting their HCP had provided too little or too much information.
Desplenter [22], 2009	Topics covered by the summary of product characteristics, especially side effects. And in addition the possible addictive character of psychotropic drugs and the way to taper or stop medication	Not applicable.	Patients spontaneously cited the treating psychiatrist, their general practitioner and the nursing staff. The hospital pharmacist was never spontaneously cited as having a role in the information providing process.	Patients seemed to be open to a wide variety of formats from verbal to written information, video, and a combination of formats. The preference varied between patients.	Not applicable.
Haut[24], 2018	Not applicable.	Not applicable.	Not applicable.	38.3% chose only the paper handout, 0.9% chose only the video, 23.3% chose a combination of the video and paper handout, and 37.4% chose only the conversation for	Not applicable.

Table 2 (*continued*)

First author and year of publication	Preferred type of information	Preferred moment of receiving information	Preferred information provider	Preferred way of communication	Patient characteristics influencing medicine information needs
				providing medicine information.	
Kim[33], 2015	Not applicable.	Not applicable.	Not applicable.	The majority of patients (82.5%) reported they liked using the iPad, found the iPad easy to use, and liked watching the video on the iPad.	Younger patients (<65 years) and female subjects significantly liked using the iPad more than older patients (P = 0.01) and male subjects (P = 0.02), respectively. Also, 92.9% of younger patients reported the iPad was easy to use compared with older patients (58.3%, P = 0.01). Education level did not influence the satisfaction survey questions.
Le Sage[43], 2008	Participants were generally satisfied with the explanation they received about the injections. Two patients wanted to know about side effects and one patient was curious to know how long these injections have been used to prevent DVT.	Of those who wished to be informed from their nurse, 3 participants (8.1%) thought the best time to receive information was when the nurse was giving them their injections.	Not applicable.	Patients wanted further information in the form of written material (n = 18, 48.6%) mostly in the form of a pamphlet, or via verbal explanations from the nurse (n = 13, 35.1%). Remaining participants preferred to obtain information from the Internet (n = 3, 8.1%), felt that any form of information would be helpful (n = 2, 5.3%).	Not applicable
Magee[25], 2021	Not applicable.	Not applicable.	Not applicable.	87.8% (36/41) of the patients enjoyed learning on the tablet.	Not applicable.
Marini[31], 2014	Not applicable.	Not applicable.	Not applicable.	Patients who watched the video were more satisfied with their education (4.8 vs. 3.4 out of 5, p < 0.001).	Not applicable.
Nickles[32], 2019	Not applicable.	Not applicable.	Not applicable.	96.4% of all participants were highly satisfied with the teach-back method used for their medication teaching.	Not applicable.
O'Leary[26], 2016	Not applicable.	Not applicable.	Not applicable.	Use of the patient portal application varied among intervention patients, with 57% using it more than once per day and 20% never using it. Overall satisfaction with the portal was high, with 76% indicating the portal was easy to use.	Not applicable.
Shen[34], 2006	Not applicable.	Not applicable.	Not applicable.	From the satisfaction survey, most participants (78%) felt that the medication education program was either very useful or useful.	Not applicable.
Superior[29], 2002	The patients found video scenes showing how to remember to take medication, actions to take in the event of adverse effects, how to dispose of unused medication, and what to do if a dose is missed especially helpful.	Not applicable.	Not applicable.	80% of the patients had a favorable response (a score of 4 or 5 out of 5) when asked how much they liked watching the videotape, 96% when asked if the videotape would help them in the future, and 93% when asked if they believed that other patients should watch the tape.	Not applicable.
Sze[36], 2020	Inpatients were more satisfied with the information they received about the action and usage of medicines compared with the potential problems with medicines. The information 'what your medicine is for' received the highest percentage of patients being satisfied (88%). On the other hand, in the 'potential problems' subscale of SIMS, 'What are the risks of you getting side effect'	Not applicable.	Not applicable.	Not applicable.	Patients aged 45–64 were more likely to be satisfied with information on 'how the medicines work' than the 65 and above as well as the 18–44 age groups (p = 0.045). Patients who attended secondary school and below were more likely to be satisfied than those attending college and above (p = 0.002). Patients of white or mixed white and

Table 2 (*continued*)

First author and year of publication	Preferred type of information	Preferred moment of receiving information	Preferred information provider	Preferred way of communication	Patient characteristics influencing medicine information needs
	scored the least percentage of patients being satisfied (46.7%)				black ethnicity were less satisfied than other ethnic groups of information regarding the impact of medication on sex life (p = 0.019). Black or black British were more likely to be satisfied towards information on unwanted medication side effects compared with other ethnic groups (p = 0.025).
Young[51] 2021	Not applicable.	Not applicable.	Not applicable.	The participants in both groups (e-learning or face-to-face education) were satisfied with the education that they received, with positive responses to each survey question being higher than 80%.	Not applicable.
Zhao[52], 2019	Not applicable.	Not applicable.	Not applicable.	Patients with from the experimental group (with audio recordings about medication) were more often satisfied with their educational method, 81.5% vs 66% (P = 0), and more often met their needs: 95,5% vs 62,4% ((P = 0).	Not applicable.

Abbreviations
DVT Deep vein thrombosis
HCP Health Care Professional
SIMS Satisfaction with Information about Medicines Scale

Table 3
The quality of the studies assessed by the Crowe critical appraisal tool (CCAT).

First author and year of publication	Preliminaries score 0–5	Introduction score 0–5	Design score 0–5	Sampling score 0–5	Data collection score 0–5	Ethical matters score 0–5	Results score 0–5	Discussion score 0–5	Total score score 0–40
Angunawela[46], 1998	-	-	-	-	-	-	-	-	0
Auyeung[38], 2011	3	5	4	2	3	5	4	4	30
Chan[44], 2020	4	4	4	2	3	5	4	4	30
Cooper[39], 2014	3	4	4	3	4	4	3	4	29
Desplenter[22], 2009	3	4	4	3	3	5	3	4	29
Desplenter[41], 2012	3	4	3	3	4	1	3	4	25
Galdeano[23], 2014	3	3	4	3	2	4	3	3	25
Hätönen[42], 2008	3	4	4	3	3	4	4	4	29
Haut[24], 2018	4	4	3	3	3	4	4	4	29
Kim[33], 2015	3	4	2	2	3	1	3	3	21
Le Sage[43], 2008	3	4	3	3	3	2	3	4	25
Magee[25], 2021	4	4	3	2	3	3	3	4	26
Marini[31], 2014	3	4	3	3	3	4	4	3	27
Nickles[32], 2019	3	3	4	2	3	2	3	4	24
O'Leary[26], 2016	4	4	3	4	4	3	4	4	30
Ong[45], 2018	4	5	3	5	3	3	3	4	30
Richler[27], 2019	4	4	4	5	3	3	3	4	30
Sheed[37], 2022	2	4	3	2	2	4	2	3	22
Shen[34], 2006	2	3	3	2	3	3	3	3	22
Superior[29], 2002	-	-	-	-	-	-	-	-	0
Sze[36], 2020	3	3	3	2	3	3	3	4	24
Trewin[47], 2003	2	3	2	2	3	0	3	2	17
Vrhovac[30], 2000	3	2	2	2	2	1	3	3	18
Young[51] 2021	4	5	5	4	4	4	4	4	34
Zhao[52], 2019	2	3	2	2	3	4	3	2	21
Zwaenepoel[35], 2006	4	5	3	3	2	2	4	4	27

admitted patients only.

The desire to receive printed information about medicine was also found by Grime et al. [48] in the in- and outpatient setting. Printed information can be delivered via various ways. Our review showed that patients are also open to modern technologies used for providing medicine information, which is hopeful since modern technologies and patient portals become more and more integrated in standard care [49,50]. The strengths of this literature review are that we included all types of

research designs, including studies that asked patients specifically on medication information needs as well as studies that measured patient satisfaction about implemented patient information methods. We conducted both backward and forward literature searches to provide a comprehensive overview of the current literature. Another strength is the independent, double assessment of the CCAT score of the studies.

Our study has several limitations. Some of the included studies were of low quality and studies often lacked a control group. Studies of lower quality were not excluded but the quality was displayed by the CCAT score. We choose not to exclude these articles in order to provide a complete and transparent overview. Since we included studies from 1996, some of the methods for providing medicine information are currently outdated. Also, the oldest studies in our review received the lowest CCAT scores. This can be explained by the fact that journals nowadays have stricter rules for publication and are more transparent, for example in publishing about ethics and the authors' conflicts of interests. The patients included in this review are not representative for the general hospitalized population. The included studies were predominantly focused on patients with cardiovascular or psychiatric care. Also, we found no studies including medicine information needs from children or their caregivers. Besides this, most of the included studies were conducted in Western countries (Australia, Belgium, Canada, Croatia, Finland, New Zealand, United Kingdom and United States of America). Hospital practice is unique in every country, for example with regards to the role and presence of a clinical pharmacists on the ward. Therefore, our results should be interpreted with caution in other populations and settings.

4.2. Conclusion

Hospitalized patients main needs about medicine information are information about adverse and beneficial effects of medication, as well as general rules about how to take medication. Preferably, this information is printed and provided at the time of prescribing by a physician that already has an relationship with the patient. Recent studies show that patients are open for the use of modern technology to provide medicine information.

4.3. Practice implications

Although the information need [2] is not a rigid set of topics about medication and the information needs cannot be determined on forehand by health care professionals, we retrieved three overlapping topics mentioned in several studies. Communication about adverse and beneficial effects of medication, as well as general rules about how to take medication can be used as a starting point, but should be further personalized. The patients individual needs and cultural background should be taken in to account when personalized information is provided. However, providing tailored information is a significant and time consuming task. Therefore, the implementation of tailored information might be a challenge due to limited staff or a high work load for health care professionals. The most recent studies show that patients are open to a wide variety of communication methods. The use of modern technology in combination with artificial intelligence might be useful to generate personalized information about medicine. This option should be further explored. Also, future research in the field of inpatients' medicine information needs should focus on the best moments to provide medicine information during hospital admission and should further investigate patients characteristics that influence medicine information needs.

Ethics approval

Not applicable.

Author contributions

SW, RZ and HvdS designed the study. SW and HvdS screened the titles and abstracts for inclusion. SW and RZ performed the full text screening. SW and EvdS assessed the quality of the studies. SW performed the analysis and drafted the manuscript. All authors discussed the design and results of the study and commented on the manuscript. All authors read and approved the final version.

CRediT authorship contribution statement

Zaal Rianne: Writing – review & editing, Validation, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **van der Kuy Hugo:** Writing – review & editing, Resources, Methodology, Conceptualization. **Wilkes Sarah:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **van der Sman Elise:** Writing – review & editing, Investigation, Data curation. **van der Sijs Heleen:** Writing – review & editing, Supervision, Methodology, Formal analysis, Conceptualization.

Declaration of Competing Interest

Sarah Wilkes, Heleen van der Sijs, Elise van der Sman, Hugo van der Kuy and Rianne Zaal declare that they have no conflict of interest.

Consent to participate

Not applicable.

Consent for publication

Not applicable.

Code availability

Not applicable.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.pec.2023.107921.

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