

Considering health literacy in communication about medications between nurses and patients with heart failure: A cross sectional observational study

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ABSTRACT

Objectives: To explore the content, style, and initiation of medication-related discussions between nurses and patients to understand how nurses support patients with heart failure, especially those with inadequate health literacy.

Methods: A cross-sectional design was conducted to observe medication-related conversations between nurses and patients with heart failure in four Dutch outpatient clinics. Conversations were audio-recorded and analyzed using MEDICODE, focusing on content, communication style (monologue or a dialogue), and initiation of the content themes. Health literacy was assessed using the NVS-D and the SBSQ. Results between health literacy groups were compared with descriptive analyses.

Results: A total of 56 patients and 14 nurses participated in the study. Patients classified by one or both of the instruments as having inadequate health literacy (n = 33; 59%) were generally older, had lower educational levels, and were more often accompanied by informal caregivers. Key themes discussed in the medication-related conversations included how the medication was identified ('medication designation'), its dosage and instruction, main effects, side effects, attitude or emotions and other ('various') themes. The 'medication designation' theme was significantly more frequently discussed in the group with adequate health literacy, whereas 'attitude or emotions' and 'various themes' were more commonly discussed among those with inadequate health literacy. Most conversations were nurse-initiated and tended to be monologues, with nurses mainly serving as information providers.

Conclusions: Nurses primarily initiated and dominated medication-related discussions with a focus on factual aspects of medication, while patients initiated more discussions about their concerns regarding medication. While there was overlap in the topics discussed, notable differences emerged between patients with adequate and inadequate health literacy.

Practice Implications: Improving communication strategies, such as structuring conversations and adopting dialogic approaches may improve patients' engagement and understanding of medication use, leading to more effective management of their condition, particularly benefiting patients with lower health literacy.

1. Introduction

The concept of health literacy refers to the knowledge, motivation, and competencies to access, understand, appraise, and apply information to make judgments and decisions in everyday life concerning healthcare, disease prevention and health promotion. It plays a crucial role in maintaining and improving quality of life [1]. For patients with

chronic conditions such as heart failure (HF), health literacy is essential for effectively performing self-management activities [2,3], including medication adherence, dietary restrictions, symptom recognition, and exercise. Proper self-management can significantly enhance quality of life and reduce hospitalizations [4–6]. Self-management is defined as an individual's ability to manage physical and psychosocial symptoms while making informed decisions about treatment and care, allowing

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them to optimally integrate the disease into their daily life [7,8].

The prevalence of inadequate health literacy varies from 27 % and 48 % across Europe [9] and between 25 % and 36 % in the Netherlands [10], with individuals in this group also experiencing poorer health outcomes [11]. A recent review highlighted challenges in self-management among patients with limited health literacy, predominantly in areas such as medical management (especially adherence), knowledge, communication, and navigating the healthcare system [12]. Effective communication skills of patients are essential for self-management, specifically for those with inadequate health literacy [13], who often struggle to understand their healthcare provider's instructions, as the information may be too clinical or impersonal [14].

Inadequate health literacy has been reported for 19–61 % of patients with cardiac diseases [15]. This is associated with reduced participation in medical decisions [16], poor communication with providers, lower medication adherence [17,18], and reduced medication refill adherence [19]. Patients with HF and inadequate health literacy experience greater challenges with medication adherence and self-management [17,20], increasing the risk of hospitalization and death [21]. As HF affects about 64 million people worldwide [22], addressing this widespread condition

requires specialized nurses who play a critical role in providing education and coaching for self-management [23].

Medication-related communication, particularly regarding those with serious consequences if taken incorrectly, is important [24], especially for patients on polypharmacy [25]. However, medication-related communication between nurses and patients with HF and inadequate health literacy remains underexplored [26]. To optimize future interventions for supporting patients with HF and inadequate health literacy, this study aimed to examine the content, style, and initiation of medication-related conversations.

2. Methods

2.1. Study design and eligibility criteria

A cross-sectional observational design was conducted to examine medication-related communication in outpatient HF clinics. Patients with HF were eligible if they were proficient in Dutch and excluded if their health condition prevented participation (e.g., terminal illness). Nurses (HF-nurses and Nurse Practitioners), working in outpatient HF

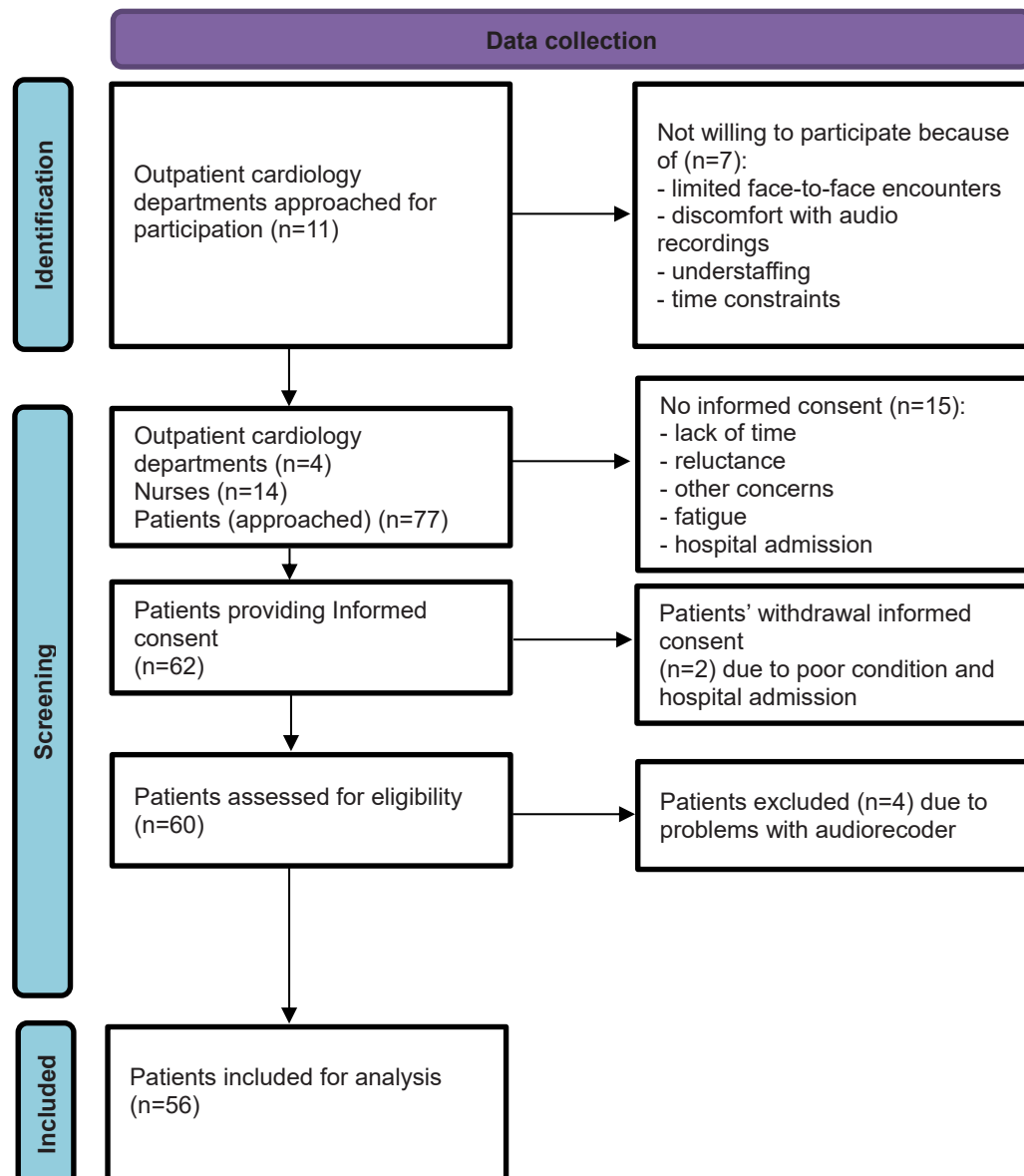


Fig. 1. Flow chart for inclusion and data collection.

clinics who were willing to participate in audio recordings were recruited from four hospitals.

This research follows the STROBE guidelines for observational studies [27] (Attachment 1).

2.2. Population and recruitment

To ensure a diverse sample, researchers approached eleven cardiology outpatient departments across the Netherlands. Fourteen nurses (three HF-nurses and eleven Nurse Practitioners) from four hospitals – one academic, one teaching, and two general – agreed to participate. Non-participation reasons included limited face-to-face interactions post-COVID-19, discomfort with audio recordings, understaffing, and time constraints.

Data was collected between January and December 2022. A total of 77 patients with HF were invited (by AD/EM) to participate while in the waiting room. Of these, 62 patients provided written informed consent. Non-participation reasons included lack of time, reluctance, preoccupation with other concerns, fatigue, and imminent hospital admission. Two patients withdrew informed consent due to an additional hospital appointment and to poor condition, resulting in a sample of 60 patients.

Nurse-patient conversations were audio-recorded using a voice recorder placed on a table in the consulting room, with no researchers present. Due to technical problems, four conversations were not recorded. The final study population included 56 patients with HF and 14 nurses (see inclusion flowchart Fig. 1).

2.3. Data collection

2.3.1. Demographic and clinical data

Demographic and clinical data, including gender, age, educational level, native language, consultation type (first or follow-up) and duration, HF severity (New York Heart Association (NYHA) classification) and cardiac medication, were collected from medical records. The presence of informal caregivers was identified by listening to the audio recordings.

2.3.2. Health Literacy

Health literacy was assessed post-consultation using both the Newest Vital Sign Dutch (NVS-D) and the Set of Brief Screening Questions (SBSQ), which together provide a comprehensive evaluation. The NVS-D measures an individual's ability to understand and apply health-related information, while the SBSQ assesses perceived confidence in handling health information. This combination captures both practical comprehension skills and self-reported competence.

2.3.2.1. Newest Vital Sign Dutch (NVS-D). This instrument, developed in 2005 to assess health literacy skills, including reading, math, and practical application [28], has been validated in Dutch [29]. It uses a nutritional label for ice cream with six related questions, awarding one point for each correct response. The total score ranges from 0 to 6, with 0–1 indicating a $\geq 50\%$ likelihood of limited literacy, 2–3 indicating possible limited health literacy, and scores of 4 and above typically representing adequate health literacy.

2.3.2.2. Set of brief screening questions (SBSQ). Chew et al. [30,31] developed the SBSQ as a reliable instrument for identifying inadequate health literacy, which was validated in Dutch [32]. It measures self-perceived health literacy with three interview questions:

- How often do you have someone help you read hospital materials?
- How confident are you filling out medical forms by yourself?
- How often do you have problems learning about your medical condition because of difficulty understanding written information?

Responses are rated on a 5-point Likert scale, ranging from 0 ('always/not at all confident') to 4 ('never/extremely confident'). A mean score of 2 or below across the three items indicates inadequate health literacy.

2.3.3. Communication: MEDICODE

MEDICODE is a coding tool [33,34] designed to describe the content of medication-related conversations. In this study, we used two forms from the original MEDICODE (summary and medication forms), to gain insight into communication about medication. The primary author (AD) completed a 45-hour online MEDICODE training provided by its developers, after which AD trained another research member (AK) in its use.

The summary form was used to explore recording characteristics (opening and closing conversations: social, factual or motivational) and medical and technical aspects of consultations, such as structuring communication, organizing upcoming content, summarizing at the end, or directing patients to specific information [35].

Medication-related communication was analyzed using the MEDICODE medication form [35], which identifies nine possible overarching themes regarding several medication-related basic themes (see Box 1). Following MEDICODE instructions, we coded who initiated each theme, recording whether the patient or nurse initiated the discussion (referred to as the preponderance of initiative). A value of -1 was assigned if the patient initiated the topic and $+1$ if the nurse initiated it. We also coded the nature of the interaction assigning a value of 0 for a monologue, 1 for a dyad (each participant speaks once), or a dialogue (a participant continues discussing a theme with at least one more turn after initiation, while the other party contributes at least once).

Informal caregivers were considered an extension of the patient, so when caregivers spoke on the patient's behalf, this was included as patient communication.

For the 56 analyzed conversations, the first nine were jointly coded and discussed by AD and AK, achieving substantial agreement for the summary form (Kappa: 0.796), and high agreement for medication designation (Kappa: 0.868). Subsequently, AK independently coded 12 encounters, while AD coded the remaining 35.

2.4. Data analysis

The sample was divided into adequate and inadequate health literacy groups based on predefined cut-off points for inadequate health literacy. For the NVS-D, a score of < 2 indicated inadequate health literacy [28], while for the SBSQ a score of ≤ 2 was the threshold [30,31]. Patients were preferably classified as having inadequate health literacy if they met the criteria of both questionnaires; otherwise, they were classified as such if at least one of the two questionnaires met the criteria. Missing data from both questionnaires were attributed to vision problems, time constraints, incomplete responses, and unwillingness to participate. The level of agreement between the two instruments was assessed using Kappa statistic.

Categorical variables are presented as numbers (n) with percentages (%), while continuous variables are presented as means (M) with standard deviations (SDs). Differences in characteristics by health literacy status were analyzed using the χ^2 test, or the Fisher's Exact test when low numbers occurred (observed count < 10 or expected count < 5) in the 2×2 table, or the Likelihood ratio test if $< 20\%$ of cells had an expected count less than 5. The independent t -test of variance was applied to analyze continuous variables. Statistical significance was set at $P < 0.05$. Data were analyzed with the Statistical Package for the Social Sciences (SPSS) version 29 (SPSS, Inc., Chicago, IL, USA).

Preponderance of initiative and dialogue ratios were calculated following the method outlined by Tobiano et al. [36] (see Table 1). The preponderance of initiative was visualized on a scale from -100% (the patient takes full initiative) to 100% (the nurse takes full initiative). Dialogue ratios were visualized on a scale from 0 (no dialogue) to 100%

Box 1

MEDICODE with (A) Summary Form and (B) Medication form.

A. Summary form**Recording characteristics:**

Starting the consultation

social, factual, motivational

Ending the consultation

*social, factual, motivational***Medical and technical aspects of the consultation:**

Nurse gave orientation / framed the communication by:

Structuring the up-coming content and/or summarizing it at the end

Never – Seldom / Sometimes – Often

Showing or stating where to find specific relevant content

Never – Seldom / Sometimes – Often

Nurse addresses the question of access to new medication

Yes / No

Nurse addresses the question of unchanged medication

Yes / No

Nurse asks for medication list

Yes / No

Nurse asks patient for allergy / intolerance

Yes / No

Patient expresses doubt / concerns about medications

*Yes / No***B. Medication form****Overarching Theme Basic theme(s)**

Medication designation

*Medication named**Long / short action specified**Medication class named**Appearance / form*

Main effect / action

*Evidence / expected effect**Observed effect**Action of medication*

Possible or observed adverse effects

*General discussion relating to possible and/or observed adverse effect**Description of a specific possible or observed adverse effect**Likelihood or incidence of the adverse effect**Severity of the adverse effect**Advices / precautions*

Warnings

Contra-indications

Dosage / instructions

*Instructions for medication use**Duration of prescription**Strength of medication**Mode of administration**Delay for expected effect*

Indications to reconsult

Special interaction(s) to consult again about the medication

Attitudes/emotions

Positive or negative attitudes or emotions expressed towards the medication

Adherence

*Patient commitment to adhere to the prescribed medication**Reported compliance**Solution(s) for compliance problems**Consequence of non-compliance*

Various themes

*Substitute of medication is mentioned**Prescription is discussed**Renewal of medication is discussed**Exclusion of medication is discussed**Suspension of medication is discussed**Medication is mentioned as (un)changed**Use and costs of medication is discussed*

(full dialogue). According to MEDICODE, dialogical roles were classified as 'information provider', 'listener', 'instigator' and 'participant'.

3. Results**3.1. Demographic and clinical data**

The study included 56 patients with HF, of whom 37 (66 %) were male and the majority were native Dutch speakers (84 %). The mean age was 69.1 ± 13.5 years, and 63 % had a low educational level based on the Statistics Netherlands' (CBS) database classification. HF symptom severity varied, with 50 % of patients reporting no to mild limitations (NYHA I or II) and the other 50 % experiencing mild to serious

limitations (NYHA III or IV). Six patients had a Left Ventricular Assist Device (LVAD). The daily intake of cardiac medications ranged from two tablets to nine tablets, with a mean of 5.8 ± 1.7 . Most patients (73 %) attended follow-up consultations, with four median consultations per nurse (IQR: 2.5–5) and a mean recording time of 27 minutes. [Table 2](#) provides a detailed overview of the demographic and clinical data.

3.2. Health literacy

Among the 56 patients, 33 (59 %) were classified as having inadequate health literacy. Of these, eight were classified as having inadequate health literacy by both instruments, six by solely the SBSQ, and 19 by the NVS-D. Similarly, for patients with adequate health literacy

Table 1
Calculations of outcome variables.

Outcome	How outcome calculated per conversation
Preponderance of initiative	→ Sum subcategories present per conversation (SumSubcategories) → Sum no of subcategories initiated by nurses (SumNInit) → Sum no of subcategories initiated by patients (SumPtInit) → Preponderance of Initiative = (SumNInit - SumPtInit)/SumSubcategories * 100
Dialogue ratio	→ Sum subcategories present per conversation (SumSubcategories) → Sum no of subcategories that are monologue (SumMono) → Sum no of subcategories that are dyad (SumDyad) → Sum no of subcategories that are dialogue (SumDialogue) → Dialogue ratio = ((SumMono * 0) + (SumDyad + SumDialogue * 1) / SumSubcategories) * 100

(n = 23), 16 were identified by both instruments, while 7 were classified by one instrument due to ‘missing data’ from the other (Fig. 2).

Patients with inadequate health literacy were significantly older (mean age = 72.7 ± 11.7) compared to those with adequate health literacy (mean age = 64.0 ± 14.6) (t(54) = 2.46; $p < 0.05$). Those with inadequate health literacy had a significantly lower educational level (χ^2 (2, $N = 54$) = 8.73, $p = 0.013$) and were more often accompanied by informal caregivers during the consultations (n = 26, 79 %) compared to those with adequate health literacy (n = 12, 52 %) (Fisher’s Exact test, $p < 0.05$) (Table 2).

3.3. Qualitative description of the communication process

3.3.1. Recording characteristics

Nurses typically initiated conversations with factual statements (n = 37), such as, ‘Last time you met my colleague, now you’re with me’ or social comments (n = 17), like, ‘How have things been going for you in recent weeks?’. Additionally, two nurses used motivational openings, for example, ‘You look better; a different look in your eyes than last time’. Most conversations concluded with factual remarks (n = 44), followed by

social comments (n = 10) or motivational endings (n = 2) (Table 3).

3.3.2. Medical and technical aspects of the conversations

In 44 conversations (79 %) nurses ‘never to seldom’ structured the upcoming content and/or provided a summary at the end. In the remaining conversations (21 %), this occurred ‘sometimes to often’. In 33 conversations (59 %), nurses ‘never to seldom’ directed the patients to specific relevant content, such as phone numbers, diaries, medication intake, salt restriction, and information about the cardiology outpatient clinic. In the remaining 23 conversations (41 %), this occurred ‘sometimes to often’.

Nurses requested a medication list from patients in 24 conversations (43 %). In eight conversations (14 %), they inquired about the accessibility of (new) medication, and in four conversations (7 %), specific questions about allergies or intolerances to medication were asked.

Patients expressed concerns about the use of some medications in 20 encounters (36 %), while in five conversations (9 %), they expressed doubts about the effectiveness of medications (Table 3).

3.4. Conversations about medication

3.4.1. Nurse-patient conversations: Medication (class) discussed

In the analyzed 56 conversations, medications were discussed a total of 338 times. The most frequently mentioned medications were diuretics (70 mentions, 21 % of all discussions), angiotensin receptor blockers (ARBs) (33 mentions, 10 %) and beta-blockers (30 times, 9 %). Other medications, such as diabetes medication, iron supplements and pain-killers, were discussed 89 times (26 %).

3.4.2. Frequency of medication themes discussed

Several themes emerged in the conversations. The theme of ‘**medication designation**’ was mentioned 314 times (93 %) and typically involved identifying the medication by name (e.g., ‘that is furosemide’) or class (e.g., ‘that is a water tablet or a diuretic’). Occasionally, the medication’s appearance was described (e.g., ‘a small white pill’). This theme was significantly more prevalent (χ^2 (1, $N = 338$) = 12.99, $p < 0.001$) in the group among patients with adequate health literacy (n = 145, 99 %) compared to those with inadequate health literacy (n = 169, 88 %).

The theme of ‘**dosage/instructions**’ of the medication, referring to

Table 2
Demographic and clinical data (N = 56).

	Total group n = 56 (100 %)	Inadequate health literacy n = 33 (59 %)	Adequate health literacy n = 23 (41 %)	P Value
Male gender	37 (66)	22 (67)	15 (65)	0.91 ^a
Mean age	69.1 (± 13.5)	72.7 (± 11.7)	64.0 (± 14.6)	0.02 ^b
Native Dutch speaker	47 (84)	31 (91)	19 (83)	0.22 ^c
Mean time consult in minutes; mean (SD)	26.8 (± 14.6)	25.0 (± 12.1)	29.4 (± 17.5)	0.27 ^b
Median consultations per nurse (IQR)	4.0 (2.5–8.0)	3.0 (2.0–4.0)	1.0 (1.0–2.0)	NA
Type consultation				
First consultation	15 (27)	7 (21)	8 (35)	0.26 ^a
Follow-up consultation	41 (73)	26 (79)	15 (65)	
Informal caregiver present	38 (68)	26 (79)	12 (52)	0.046 ^c
Educational level (n = 54*)				
High	10 (19)	2 (6)	8 (38)	0.013 ^a
Moderate	10 (19)	7 (21)	3 (14)	
Low	34 (63)	24 (73)	10 (48)	
NYHA classification (n = 55*)				
I or II	28 (50)	16 (48)	12 (54)	0.66 ^a
III or IV	28 (50)	17 (52)	10 (45)	
Medication discussed per consultation; mean (SD)	6.0 (3.5)	5.8 (3.2)	6.5 (3.9)	0.5 ^b
Range	1–14	1–12	1–14	
Cardiac medication used; mean (SD)	5.8 (± 1.7)	6 (± 1.7)	5.5 (± 1.6)	0.25 ^b

Data are presented as mean ± Standard Deviation (SD) or as n (%). IQR = Inter Quartile Range. NA = Not Applicable NYHA = New York Heart Association. *) 2 missing values #) 1 missing value \$) Coumarins and DOACs

P Values: a) Pearsons Chi-Square b) Independent T-test c) Fisher’s Exact test

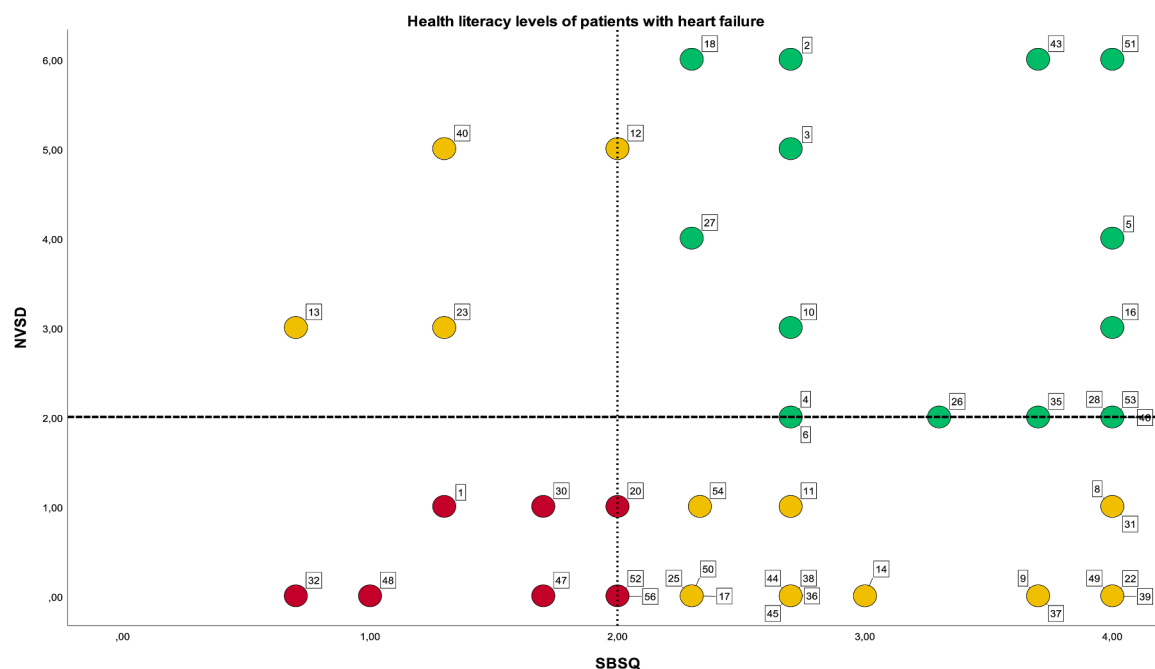


Fig. 2. Health literacy levels of patients with heart failure.

Table 3
Summary form.

	Total group n = 56 (100 %)	Inadequate health literacy n = 33 (59 %)	Adequate health literacy n = 23 (41 %)	P value
Recording characteristics				
Starting the Conversation				
Social	17 (30)	9 (27)	8 (35)	0.11 ^b
Factual	37 (66)	24 (73)	13 (57)	
Motivational	2 (4)	0 (0)	2 (9)	
Ending the consultation				
Social	10 (18)	5 (15)	5 (22)	0.30 ^b
Factual	44 (79)	26 (79)	18 (78)	
Motivational	2 (4)	2 (6)	0 (0)	
Medical and technical aspects:				
Structuring up-coming content and/or summarizing it at the end				
Never-seldom	44 (79)	26 (79)	18 (78)	1.00 ^c
Sometimes-often	12 (21)	7 (21)	5 (22)	
Showing or stating where to find specific relevant content				
Never-seldom	33 (59)	21 (64)	12 (52)	0.39 ^a
Sometimes-often	23 (41)	12 (36)	11 (49)	
Questions of access to new medication				
Yes – No	8 (14)–48 (86)	3 (9)–30 (91)	5 (22)–18 (78)	0.25 ^c
Questions of medication list or roll				
Yes – No	24 (43)–32 (57)	14 (42)–19 (58)	10 (43)–13 (56)	0.94 ^a
Question of Allergy/intolerance				
Yes – No	4 (7)–52 (93)	1 (3)–32 (97)	3 (13)–20 (87)	0.30 ^c
Patient expressed doubt about effectiveness				
Yes – No	5 (9)–51 (91)	1 (3)–32 (97)	4 (17)–19 (83)	0.15 ^c
Patient expressed concerns about medication				
Yes – No	20 (36)–36(64)	12 (36)–21 (64)	8 (35)–15 (65)	1.00 ^c

Data are presented as n (%). a) Pearsons Chi-Square Test b) Likelihood Ratio c) Fisher's Exact Test

how to take the medication properly, was discussed 163 times (48 %), with no significant differences between the groups. This typically included information about the frequency and dose (e.g., 'once a day 25 milligrams').

The theme of 'main effect/action' was discussed 106 times (31 %) and included explanations of the expected effects of medications (e.g., 'Metoprolol slows down your heart rhythm') and the observed effects (e.g., 'That medicine makes you go to the toilet frequently').

The theme 'possible/observed adverse effects' was discussed 85

times (25 %), highlighting complaints that may be medication-related (e.g., 'I have annoying side effects since I use beta-blockers').

The theme of 'attitudes/emotions' towards medications was discussed 57 times (17 %), reflecting participants' positive or negative feelings about their medications (e.g., 'I am concerned about the amount of medication I take'). This theme was significantly more prevalent among patients with inadequate health literacy (n = 45, 24 %) compared to those with adequate health literacy (n = 12, 8 %) (χ^2 (1, N = 338) = 14.05, $p < 0.001$).

The topic of ‘**Various themes**’ was mentioned 138 times (41 %) and included subthemes such as ‘medications mentioned as (un)changed’ (e.g., ‘*See whether you benefit from a new tablet*’) and ‘discussing the discontinuation of medication’ (e.g., ‘*This tablet has been stopped*’). Another subtheme, ‘prescription discussed’ (e.g., ‘*I prescribe the same medication you have had before*’) contributed less to this overall theme. This theme occurred significantly more frequently among patients with inadequate health literacy ($n = 95$, 50 %) compared to those with adequate health literacy ($n = 42$, 29 %) ($\chi^2 (1, N = 338) = 16.18$, $p < 0.001$).

Themes such as ‘indications to consult again’, ‘adherence’ to medication and ‘warnings’ were discussed in fewer than 15 % of the conversations, detailed in Table 4.

3.4.3. Preponderance of initiative, dialogue ratio and dialogue roles

Fig. 3 displays the preponderance of initiative and dialogue ratio across the nine themes observed. The preponderance of initiative was positive in seven of these themes – ‘medication designation’, ‘dosage/instructions’, ‘various’, ‘main effect/action’, ‘possible/observed adverse effects’, ‘indications to consult again’ and ‘warnings’ – indicating that nurses took more initiative than patients. However, in two themes, ‘attitudes/emotions’ and ‘adherence’, the preponderance of initiative was negative, indicating that patients took more initiative.

The dialogue ratio between 0.5 and 1 in four themes – ‘warnings’, ‘indications to consult again’, ‘adherence’, and ‘possible/observed adverse effects’ – indicates a more balanced exchange between nurses and patients suggesting a dialogic nature. Conversely, the remaining themes had dialogue ratios between 0 and 0.5, indicating a less dialogic nature.

Nurses primarily acted as information providers across most themes. However, in the ‘attitude/emotions’ theme, nurses had the role of

listener. In the ‘possible/observed adverse effects’ theme, nurses had the role of instigator, while in ‘adherence’ they participated in the dialogue. Correspondingly, patients typically assumed the role of listener in most themes, but for ‘attitude/emotions’ they became the information providers. In ‘possible/observed adverse effects’, they played the role of participant, and for ‘adherence’ they acted as instigators.

Fig. 4 shows that three themes – ‘attitude/emotions’, ‘indications to consult again’, and ‘possible/observed adverse effects’ – fall into different quartiles, indicating varying dialogue roles between nurses and patients, depending on levels of health literacy.

4. Discussion and conclusion

4.1. Summary of findings

This study explored how nurses and patients with HF discuss medications, with a focus on the content, communication style, and topic initiation. Most patients were over 65 years old, had lower levels of education, and inadequate health literacy, with many accompanied by informal caregivers. Conversations mainly focused on identifying the medication, its dosage, effects and potential side effects. Nurses typically initiated most discussions, often in a monologue format, while patients were more likely to initiate dialogues related to ‘adherence’ and ‘attitudes and emotions’.

Medication adherence, crucial in preventing rehospitalizations and complications [37], was rarely mentioned explicitly in our study, but often addressed implicitly through other themes. While discussing adherence is important, it is also crucial to consider the various factors influencing it. These include socio-economic factors (such as education level and living arrangements), health care system factors (such as patient satisfaction and trust in providers), treatment-related factors (including previous hospitalizations, pill burden, packaging, and costs) and patient-related factors (such as forgetfulness, motivation for well-being, and routine) [38]. Providing patients with relevant information (what, how and why) about their medications can help them understand the purpose of their medication, reduce concerns about the medication [39], and support adherence to prescribed regimes. We also found that patients with inadequate health literacy were more likely to express emotions or attitudes about their medication, though we did not explicitly report on whether these were positive or negative attitudes and how nurses responded to them. Many of the emotions were related to concerns about their medication. Previous studies have shown that patients with inadequate health literacy tend to have more concerns about overuse and potential harmful effects of medications [40,41]. To address these concerns, nurses should discuss potential side effects and regularly check for any perceived adverse effects [42]. Moreover, qualitative studies show that a trusting relationship between patients and healthcare providers can contribute to a sense of security, lowering thresholds to asking questions and raising concerns [43,44].

To address medication adherence and patient concerns, shared decision-making (SDM) may be helpful. SDM, a collaborative communication process where clinicians and patients make healthcare decisions based on patient’s values and preferences, has traditionally focused on device therapy and palliative care in patients with HF [45, 46]. However, with the increasing complexity of HF pharmacotherapy, new SDM strategies are being developed for pharmacotherapy treatment options [47]. Across Europe, HF nurses often play a key role in prescribing and discussing medication options with patients [48]. To facilitate SDM, we expected in our study that medication-related communication would be more dialogic, with nurses acting as participants. However, this was not the case for most themes in our study. Research shows that patients with lower health literacy are less likely to be able to fully participate in SDM, putting them at greater risk for poorer health and social outcomes [49,50]. Therefore, it is essential to ensure that decision-making tools are simple and easy to read, especially for individuals with limited health literacy.

Table 4

Frequency of content themes and specific themes divided in adequate health literacy and inadequate health literacy ($n = 338$).

Content themes and subthemes	Frequency of all $n = 338$	Frequency of IAHL ($n = 191$)	Frequency of AHL ($n = 147$)	P value ^a
Medication designation	314 (93)	169 (88)	145 (99)	<0.001
Dosage / Instructions	163 (48)	90 (47)	73 (50)	0.64
Various Themes	138 (41)	96 (50)	42 (29)	<0.001
Mentioned as (un)changed	77 (23)	61 (32)	16 (11)	< 0.001
Exclusion discussed	40 (12)	25 (13)	15 (10)	0.42
Prescription discussed	31 (9)	26 (14)	5 (3)	0.001
Main effect / action	106 (31)	60 (31)	46 (31)	0.98
Possible / observed adverse effects	85 (25)	47 (25)	38 (26)	0.79
Attitude / emotions towards medication	57 (17)	45 (24)	12 (8)	<0.001
Indications to consult again	40 (12)	26 (14)	14 (10)	0.25
Adherence to medication	23 (7)	12 (6)	11 (7)	0.66
Warnings	10 (3)	6 (3)	4 (3)	0.82

Data are presented as n (%). IAHL = inadequate health literacy; AHL = adequate health literacy; ^aPearsons Chi-Square Test

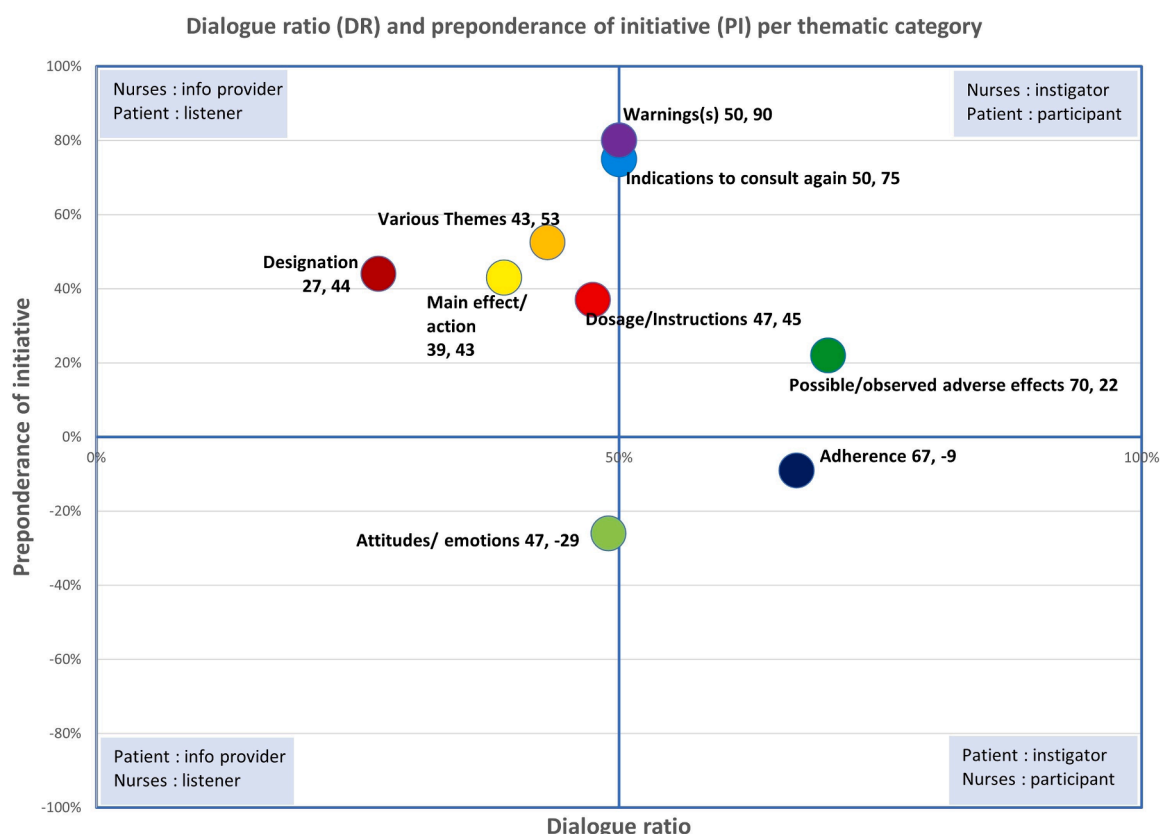


Fig. 3. Role in dialogue (note: the first digit is for dialogue ratio, the second for preponderance of initiative, in the blue boxes, the roles of the participants).

This study adds to the existing knowledge of real-time communication dynamics between nurses and patients, particularly regarding medication discussions. An integrative review of 52 articles on communication revealed that only two studies focused specifically on medication-related conversations [51]. Despite differences in settings and designs, some of our findings are consistent with those studies. For example, Bolster and Manias observed in a qualitative study in an Australian acute care ward that nurses frequently initiated and dominated conversations when providing information to patients [26,52]. Given the high prevalence of inadequate health literacy among patients with HF [15], health information must be communicated in a way tailored to each individual. This is challenging, as there is limited evidence on effective communication strategies for patients with inadequate health literacy [53]. However, they may benefit from strategies like the teach-back method [54], and explanations of how to interpret numerical data [55], supplemented by visual aids [56].

In 68 % of the consultations we observed, patients were accompanied by an informal caregiver highlighting their critical role in supporting patients with managing their HF. Informal caregivers provide a range of support, from offering care recommendations to directly assisting patients in managing their care when patients are unable to do so, such as assisting with medications [57,58]. A meta-synthesis of 10 qualitative studies [59], described that caregivers often seek support in their role, particularly in recognizing HF exacerbations [60]. These findings underline that caregivers are important stakeholders in HF care. Nurses should therefore empower caregivers with HF-related knowledge and skills by providing appropriate training materials and supporting caregivers in caring for their partner [61].

In this study, 59 % of the patients were classified as having inadequate health literacy, significantly higher than the 30–39 % reported in two reviews on patients with cardiovascular disease [3] and HF [2]. These reviews highlight the broad variability in health literacy levels, ranging from 10 % to 69 % and 17–97 %, depending on the assessment

tool used [2,3], reflecting the challenge of measuring this complex concept. Although we identified a relatively high percentage of patients with inadequate health literacy, it is important to note that this classification typically stems from a low score on either the NVS-D or the SBSQ, with the NVS-D classifying more rigorously, rather than from both instruments. The agreement between the two instruments was minimal (Kappa: 0.113). Both instruments are frequently used [62] but differ in nature. The NVS-D is a performance-based instrument, emphasizing ‘understanding’ and ‘numeracy’, requiring reading skills, whereas the SBSQ is a self-reported, interview-based instrument focusing on ‘accessing’ and ‘understanding’ health-related information [63]. The choice of assessment tools may depend on the specific aspects being evaluated and the possibility of discrepancies between measured and actual health literacy levels [64]. Due to its self-reported nature, the SBSQ may be prone to cognitive biases, such as the Dunning-Kruger effect, where individuals overestimate their health literacy [65]. Measuring health literacy is challenging, as highlighted in the NVS-D validation study [29], which reported weak correlations with the self-reported health literacy instrument HLS-EU-Q16. Nevertheless, both instruments, offer valuable insights into the role of health literacy in health-related decision-making.

4.2. Strengths and limitations

This study’s strengths include the use of two validated instruments for assessing health literacy, combined with real-time observations and analysis of conversations using MEDICODE. However, selection bias might be a potential concern because patients were selected based on proficiency in Dutch. This may have excluded certain individuals, such as older patients with a migration background who are often at higher risk and have poorer health outcomes compared to older individuals born in the Netherlands [66].

The study may also be influenced by the Hawthorne effect, as the

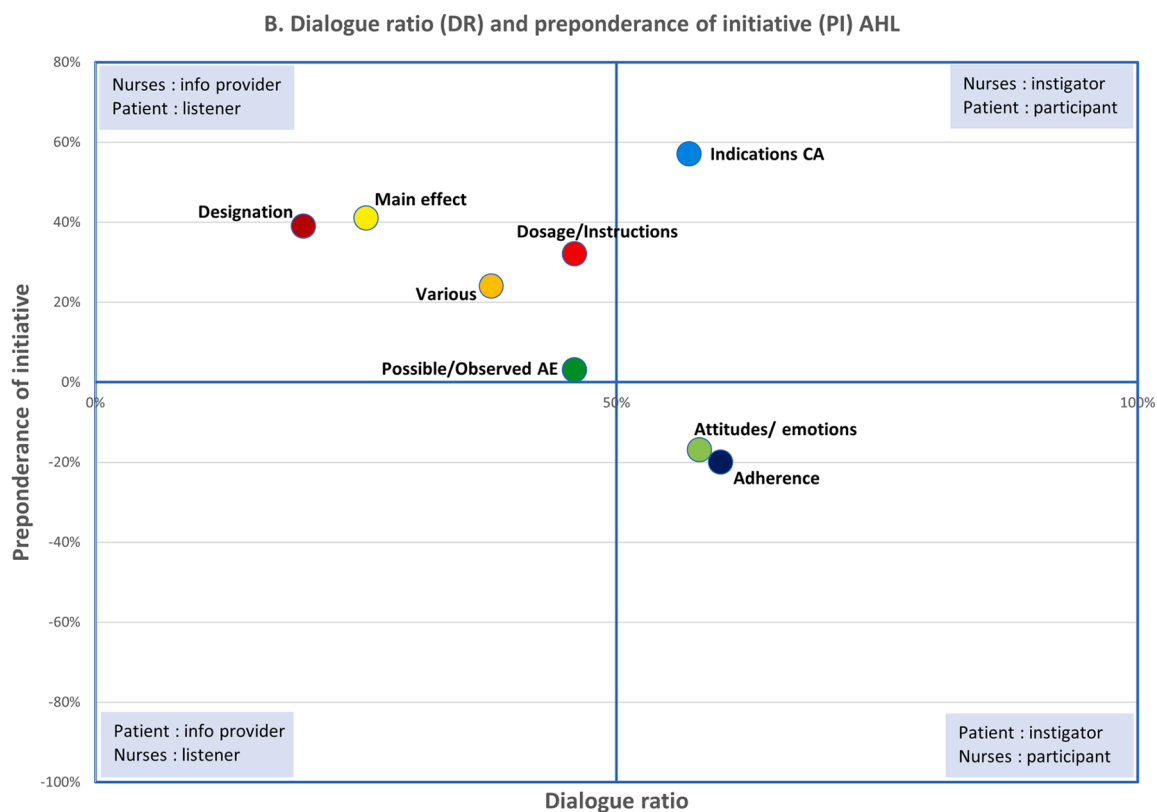
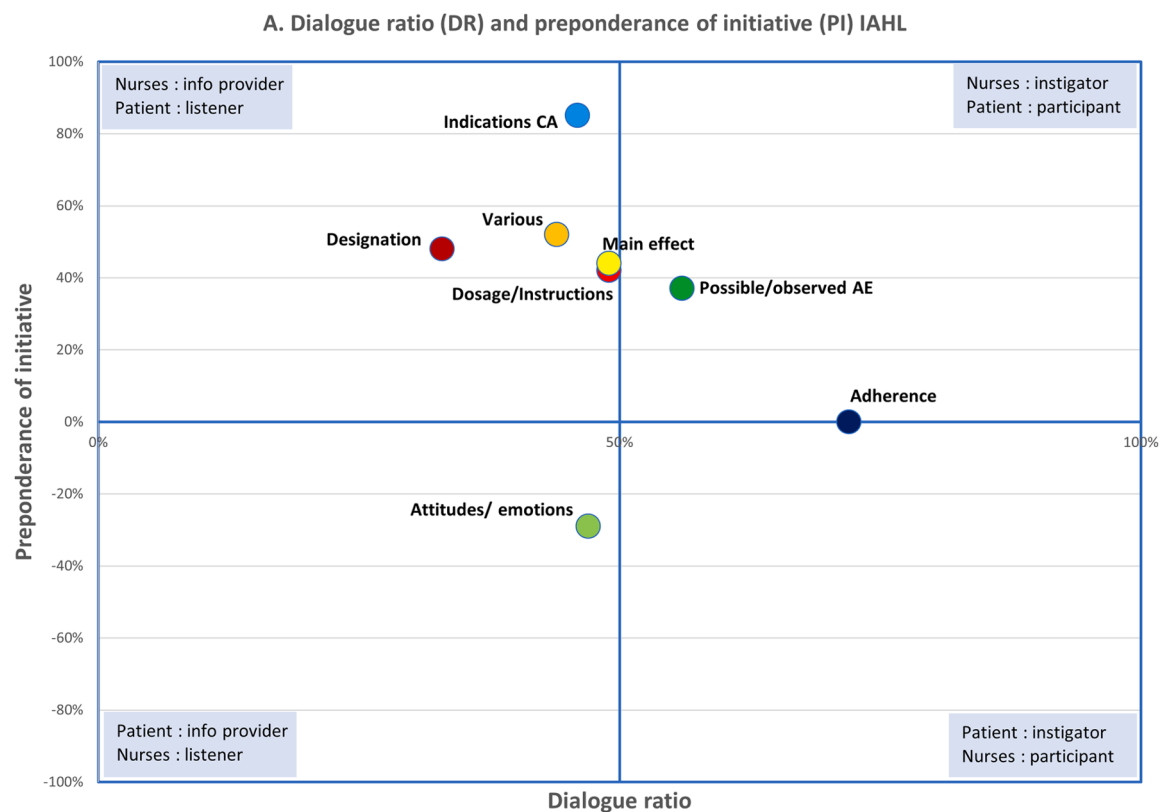


Fig. 4. Differences between inadequate health literacy (A) and adequate health literacy (B).

audio recording of consultations could have led nurses to display desired behaviors. Another possible limitation is that the same nurses were observed multiple times during the study, with the risk of observing a consistent communication style across consultations. As a result, specific themes might have been reported more or less frequently. Ideally, we would have prospectively stratified or randomized to address this, but the limited number of participating nurses made this unfeasible. The final limitation we address is the distribution between the consultations (initial or follow-up). We observed relatively more follow-up consultations, which may have led to an over- or underrepresentation of some themes. For example, adverse events were not so frequently observed, possibly because patients had been on the same medication for an extended period. We encourage readers to consider these limitations when interpreting the results of this study.

5. Conclusion

This study explored the content, style and initiation of medication-related conversations between HF-nurses and patients with HF, with a particular emphasis on health literacy. Nurses primarily initiated and dominated the discussions focusing on factual aspects of medication. Patients took the initiative when experiencing difficulties or worries related to medication intake.

The study showed differences between consultations with people with adequate and inadequate health literacy in the topics discussed. Nurses hardly discussed adherence and seldomly used shared decision-making strategies, even though especially patients with inadequate health literacy could benefit from this.

Future research should aim to identify the communication skills nurses require to effectively engage with individuals who have inadequate health literacy. Additionally, it should prioritize individuals who are vulnerable for inadequate health literacy and who are often excluded from research due to eligibility criteria.

5.1. Practice implications

The findings of this study suggest that improving communication strategies, such as structuring conversations and adopting a more dialogic approach, could improve patients' engagement and their understanding of medication use. When communicating with patients who have inadequate health literacy, this becomes particularly important for effectively managing their condition.

Research ethics and patient consent

This study does not fall under the scope of the Dutch Medical Research Involving Human Subjects Act (WMO). It therefore does not require approval from an accredited medical ethics committee in the Netherlands. However, in Erasmus MC Rotterdam, an independent quality check has been carried out (METC-2021-0712) to ensure compliance with legislation and regulations (regarding Informed Consent procedure, data management, privacy aspects and legal aspects).

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CRediT authorship contribution statement

Heide John de: Writing – review & editing, Visualization. **Klis Annemarie van der:** Writing – review & editing, Investigation, Conceptualization. **Maghroudi Ekram:** Writing – original draft, Methodology, Investigation, Conceptualization. **Driel Anne Geert van:** Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Jaarsma Tiny:** Writing –

review & editing, Supervision, Conceptualization. **Staa AnneLoes van:** Writing – review & editing, Supervision, Conceptualization. **Hooff Susanne van:** Writing – review & editing, Supervision, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.pec.2025.108709](https://doi.org/10.1016/j.pec.2025.108709).

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