

Challenges adhering to a medication regimen following first-time percutaneous coronary intervention: A patient perspective

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ABSTRACT

Background: Percutaneous coronary intervention (PCI) is the most common therapeutic intervention for patients with narrowed coronary arteries due to coronary heart disease (CHD). Although it is known that patients with CHD often do not adhere to their medication regimen, little is known about what patients undergoing PCI find challenging in adhering to their medication regimen after hospital discharge.

Objectives: To explore patients' experiences in adhering to a medication regimen following early post-discharge after first-time PCI.

Design: An exploratory and descriptive design was used to conduct in-depth interviews of patients undergoing first-time PCI.

Settings: Participants were recruited from a single tertiary university hospital, which services a large geographical area in western Norway. Patients fulfilling the inclusion criteria were identified through the Norwegian Registry for Invasive Cardiology (NORIC).

Participants: Participants were patients aged 18 years or older who had their first PCI six to nine months earlier, were living at home at the time of study inclusion, and were prescribed dual antiplatelet therapy. Patients who were cognitively impaired, had previously undergone cardiac surgery, and/or were prescribed anticoagulation therapy with warfarin or novel oral anticoagulants were excluded. Purposeful sampling was used to include patients of different gender, age, and geographic settings. Twenty-two patients (12 men) were interviewed between December 2016 and April 2017.

Methods: Face-to-face semi-structured interviews were conducted, guided by a set of predetermined open-ended questions to gather patient experiences on factors relating to medication adherence or non-adherence. Transcribed interviews were analysed by qualitative content analysis.

Findings: Patients failed to adhere to their medication regimen for several reasons; *intentional and unintentional reasons, multifaceted side effects from heart medications, scepticism towards generic drugs, lack of information regarding seriousness of disease after PCI, psychological impact of living with coronary heart disease*, and these interacted. There were patients who felt that the medication information they received from physicians and nurses was uninformative and inadequate. Side effects from heart medications were common, ranging from minor ones to more disabling side effects, such as severe muscle and joint pain and fatigue. Patients found well-established medication taking routines and aids to be necessary, and these improved adherence.

Conclusion: Patients undergoing first-time PCI face multiple, interacting challenges in trying to adhere to prescribed medication regimens following discharge. This study highlights the need for a more structured follow-up care for these patients in order to improve their medication adherence and to maximise their self-care abilities.

Keywords: Barriers to comply, Coronary heart disease, Medication adherence, Patient experiences, Qualitative analysis

Contribution of the Paper

What is already known about the topic?

- Percutaneous coronary intervention (PCI) is the most common therapeutic intervention for patients with narrowed coronary arteries due to coronary heart disease (CHD).
- Even though great strides have been made towards a better understanding of medication adherence and its impact on clinical practice, medication adherence rates remain disappointingly low for patients with CHD.
- There is relatively little information about which factors patients undergoing PCI find to be challenging in adhering to their post-discharge medication, especially in the first 12 months.

What this paper adds

- This is the first study specifically designed to explore patients' experiences regarding medication adherence while living at home six to nine months after first-time PCI.
- Receiving little education about the importance of adhering to their medications and useful follow-up care substantially affected daily living, and this impact was particularly important for those patients who experienced side effects from their medication.
- The findings enhance understanding of the emotional, physical, and psychological struggles patients undergoing first-time PCI experience.
- The findings also suggest that shifting towards more holistic person-centred care has the potential of maximising patients' self-care abilities and thereby improving medication adherence.

1. Introduction

Over the last few decades, percutaneous coronary intervention (PCI) has been one of the fastest growing therapeutic interventions for patients with narrowed coronary arteries due to coronary heart disease (CHD).¹ Despite the availability of improved treatment methods, these patients continue to live with chronic heart disease, a scenario with implications not only for these patients but also for families, healthcare professionals, healthcare systems, and society at large. Improved treatment methods also mean that patients are discharged from hospitals sooner, often on the same day or a few days after PCI. This decreases the likelihood that they will receive adequate education about the importance of adhering to complex medication regimens and that will come to appreciate the seriousness of their disease.^{2,3}

Transitioning from hospital to home is particularly challenging for patients. After short hospital stays, patients need to adjust their lifestyle at home, incorporate into their daily routine new medications, and acquire an expanded care team.^{4,5} This is an aspect of post-discharge care that has scarcely been investigated, even though it affects a large patient population. Several studies have reported poor medication adherence in patients with CHD.⁶⁻⁸ However, it is unknown whether this also is the case for patients after PCI, as few studies have reported on follow-up care for these patients.^{3,9} This gap is particularly concerning in relation to older patients with acute coronary syndrome, since a recent study showed that PCI also benefits them.¹⁰ Older patients may need even more education on the importance of adhering to their medication before discharge¹¹.

Delamater has defined adherence as the ‘active, voluntary, and collaborative involvement of the patient in a mutually acceptable course of behaviour to produce a therapeutic result’.¹² This implies that patients and healthcare professionals need to agree on mutually defined treatment goals and medical regimens. If these goals are not charted out together, ineffective communication among healthcare professionals and patients

compromises the continuity of care and the patients' understanding of their disease, appreciation of its potential complications, and the importance of medication adherence.^{13, 14}

Typical medications prescribed after PCI, such as beta-blockers, statins, and ACE-inhibitors, have long-term prognostic effects, whereas dual antiplatelet therapy (DAPT), comprising acetylsalicylic acid and adenosine diphosphate receptor inhibitors (e.g., clopidogrel or ticagrelor), have an immediate effect on prognosis.¹⁵ Failure to adhere to the prescribed medication regimen is associated with poor clinical outcomes, higher readmission rates, increased healthcare costs, and increased morbidity and mortality.^{8, 16} Indeed, poor adherence to DAPT in particular may lead to immediate stent thrombosis within days or weeks, with a 15-45% mortality rate.¹⁵

Factors affecting medication adherence are multifaceted. The WHO has categorised adherence factors into five dimensions, those related to the (1) healthcare team; (2) socioeconomics; (3) therapy; (4) patient; and (5) illness.¹⁷ Medication non-adherence can also be classified as either intentional or unintentional. Intentional non-adherence refers to situations in which patients deliberately choose to either reduce or stop taking their medication. It is largely associated with patient motivation.¹⁸ Unintentional non-adherence is related to patients' lack of capacity or cognitive resources, which hinder them from adhering to a medication regimen (e.g., forgetfulness, cognitive impairment). The intentional/unintentional aspects are not mutually exclusive concepts, as unmotivated patients, with regard to taking their medications, are also more likely to forget to take them.¹⁸ To better understand and improve patients' medication adherence, all potential determining factors must be identified and considered.^{17, 19} One way to reach this goal is to try to understand the patient as a whole.

Shifting one's healthcare perspective towards holistic person-centred care can potentially maximise patients' self-care abilities and improve medication adherence.

However, evidence remains inconclusive.²⁰ The aim of this study, therefore, was to explore patients' experiences in adhering to a medication regimen following early post-discharge after first-time PCI.

2. Methods

2.1. Design

An exploratory design was used to conduct in-depth interviews of patients undergoing first-time PCI. The interviews were organized around a set of predetermined open-ended questions and were conducted between December 2016 and April 2017. Furthermore, the study is part of the multimethod, multicentre CONCARD^{PCI} study.

2.2. Patients and Settings

A group of 50 patients from a tertiary referral centre that performs PCI procedures in western Norway was invited to participate in the study. This study population was purposively sampled according to gender, age, and geographic characteristics. Inclusion criteria were the following: patients who had undergone first-time PCI six-to-nine months earlier, and who were ≥ 18 years, living at home at the time of study inclusion, and prescribed DAPT. The six-to-nine month time interval was chosen because studies show that adherence to DAPT generally starts to decline after six months and significantly declines by 12 months post-PCI.²¹ In addition, to ensure that patients' experiences with medication adherence were sampled before 12 months had elapsed, since DAPT is typically prescribed for one year following acute coronary syndrome.²² Exclusion criteria were the following: patients who previously had undergone cardiac surgery and/or were prescribed anticoagulation therapy with warfarin or novel oral anticoagulants, and patients who did not speak Norwegian or were unable to answer questions due to cognitive impairment. Patients fulfilling the inclusion

criteria were identified through the Norwegian Registry for Invasive Cardiology (NORIC).

Twenty-five patients who were invited did not respond, two patients were excluded because they were cognitively impaired, and one patient was excluded because of warfarin treatment.

Characteristics of included patients are presented in Table 1.

Table 1. Demographic and clinical characteristics of patients who received percutaneous coronary intervention

Characteristics	Count (N=22)
Gender	
Male	12
Female	10
Age, years	
< 67	14
≥ 67	8
Cohabitation status	
Married/cohabiting	16
Living alone	6
Employed	
Yes	12
No	10
Acute coronary syndrome states	
ST-segment elevation myocardial infarction	4
Non-ST-segment elevation myocardial infarction	15
Stable coronary disease	3
Mean length of hospital stay, days (range)	3.3 (1-7)
Comorbidities	
Hypertension	7
Hypercholesterolemia	4
Previous myocardial infarction	1
Diabetes	1
Risk factors for CHD	
Current smokers	6
Body mass index >25	15
Heredity ^a	12
Participation in cardiac rehabilitation post-discharge	
Yes	8
No	14
Discharge medications prescribed	
DAPT ^b	22
Statins	22
Beta-blockers	10
ACE-inhibitors ^c	5
Diuretics	3
Proton pump inhibitors	4
Number of discharge medications	
3	2
4	9
5	5
6	3
7	2
8	1

^aGenetic risk factors for CHD, ^bDual antiplatelet therapy, ^cAngiotensin-converting enzyme inhibitors

2.3. Interview guide and data collection

A semi-structured interview guide (Box 1) that was a collection of predetermined, open-ended questions was developed. The questions were developed based on the authors' clinical experience with patients after PCI and on studies seeking feedback from patients on specific factors relating to medication adherence.^{23, 24} The Social Ecological Model, a theory-based framework for understanding the multifaceted and interactive effects of personal and environmental factors which determine behaviours (personal-, interpersonal-, community-, organizational, and policy level), further guided the development of the interview guide²⁵. Two pilot interviews were conducted to troubleshoot and refine the questions. No other changes were made to the interview guide after this refinement.

Box 1. Core questions of the semi-structured interview guide, which was informed by the hierarchic levels of the Social Ecological Model.²⁵

QUESTION	LEVEL(S)
Please describe primary reasons for not taking your medications as prescribed?	Personal level
Please describe interpersonal relationships or aids you use to take your medication as prescribed?	Interpersonal and community level
Please describe the information you received about your medication and how this was communicated?	Organisational level
Please describe problems or concerns you have experienced when receiving generic drugs from the pharmacy?	Policy level

A detailed introductory letter, including an invitation to participate in the study, was sent by postal mail to potential participants. The letter identified the principal investigator and affiliation, and provided information about the aim of the study. Non-responders were reminded once by postal mail after two weeks had passed. If another two weeks passed without a response, they were excluded for further consideration, and the NORIC database was queried for a replacement. Candidate replacement participants matched the non-responders in age, gender and geographic settings. This process was repeated until a

purposeful sample was achieved that captured the richness, breadth of experiences, and relevance to the research questions.

Interviews were conducted by the first author either in the patients' home or in meeting rooms at the university hospital, depending on the patients' preferences. To conclude the interview, the first author summarised the content with the interviewee in order to verify that he correctly understood the content communicated by the participant. Interviews lasted 17-60 minutes, were audio-recorded, and later transcribed verbatim. Participant names and other personal identifiers were removed from the transcripts.

2.4. Data analysis

An abductive approach was undertaken in order to obtain a more complete understanding of the challenges patients faced in adhering to their medication after first-time PCI. The abductive approach distinguishes itself from induction and deduction by enriching the understanding of the source material, in this case patients undergoing PCI and their experiences with medication adherence²⁶. This implied a movement between deductive and inductive approaches. It was deductive in that the interview guide was structured according to the theoretical framework of the Social Ecological Model²⁵, and it was inductive in that the data material was manifest and latent analysed according to the phenomenon studied through qualitative content analysis.²⁷

Firstly, before transcribing the audiotaped interviews, each interview was listened to twice in order to obtain a sense of the whole patient experience. Secondly, text relating to challenges of medication adherence was divided into meaning units, which were then condensed into smaller units. The condensed meaning units were then abstracted and coded. Thirdly, codes were compared based on differences and similarities and sorted into six categories, constituting the manifest content. For the latent content, these categories were

abstracted into two sub-themes. Finally, an overarching theme representing the underlying meaning of the categories and sub-themes emerged (Table 2). The first author, who carried out these steps, discussed the complete analysis process with two of the co-authors, who are experienced with qualitative research methods and with issues dealt with by patients undergoing PCI. This discussion and adjustments were iteratively done until consensus was reached among the co-authors.

Table 2. Examples of how participant quotations were used in the analysis procedure of an emerging theme

Theme: Medication adherence is a multidimensional phenomenon requiring action on several interacting levels

Meaning unit	Condensed meaning unit	Code	Category	Sub-theme
<i>'In relation to side effects, I am tempted to quit everything and see what happens, because I am so sick of side effects. I cannot take it anymore.'</i>	Tempting to quit all medications due to side effects; cannot bear any more side effects	Wants to stop taking medications because of side effects	Intentional and unintentional reasons for medication non-adherence	Reasons for medication non-adherence are diverse
<i>'My body has become so stiff. Muscle ache. Yes, and depressed. Well, not exactly depressed; I am not sure what to call it. But lacking initiative and feeling under the weather [due to statin treatment]. Now I am going to start crying'.</i>	Muscle pain and stiffness and lacking initiative after commencement of statin treatment	Muscle pain and lacking initiative because of side effects from statin treatment	Multifaceted side effects from heart medications	
<i>'I never take generic drugs anymore. I have tried it once, and it did not work for me even though it is supposed to be the same active ingredients... I felt sick and unwell. That is why I only take what the doctors prescribe, I have tried, and know to work. No matter the cost.'</i>	Do not take generic drugs anymore, have tried it once but felt sick and unwell, only takes what he has tried and knows to work despite increased costs	Only uses brand-name drugs due to a bad experience with generic drugs	Scepticism towards generic drugs	
<i>'I remember sending a text to my friends saying, "completely undramatic, I have just done a PCI." But I do not find it undramatic anymore. It is a serious thing, a really serious thing'</i>	Texting her friends and telling them about an undramatic procedure; in retrospect, she finds the procedure serious	Altered view about the seriousness of the procedure	Lack of information about seriousness of heart disease after PCI	Need to address challenges and promote medication-taking behaviour
<i>'Both before and after the summer holiday I participated in a cardiac rehabilitation programme. And everything was fine. Because then I had someone to talk to. I worked out and felt that my physical form was decent. During the fall and the winter I have experienced some of the mental struggles everybody describes. When you suddenly are sitting there alone, when you are not working or anything, then you feel it.'</i>	Everything was fine when he participated in a cardiac rehabilitation programme. Experienced increased psychological strain when he did not have a job or anyone to talk to	Loneliness leads to increased psychological strain after myocardial infarction	Psychological impact of living with coronary heart disease	

'Always use a pillbox. And keep the pillbox available so you can see that you have taken your medication... Take the medication during your morning ritual. Because if you always drink a cup of coffee in the morning, and the medication is right next to the coffee machine, it is quite natural to take it, because then you see it...'

Always use a pillbox; keep the pillbox readily available; take the medication in conjunction with a morning ritual

The use of a pillbox and well-established routines improves medication adherence

Need for well-established routines and aids

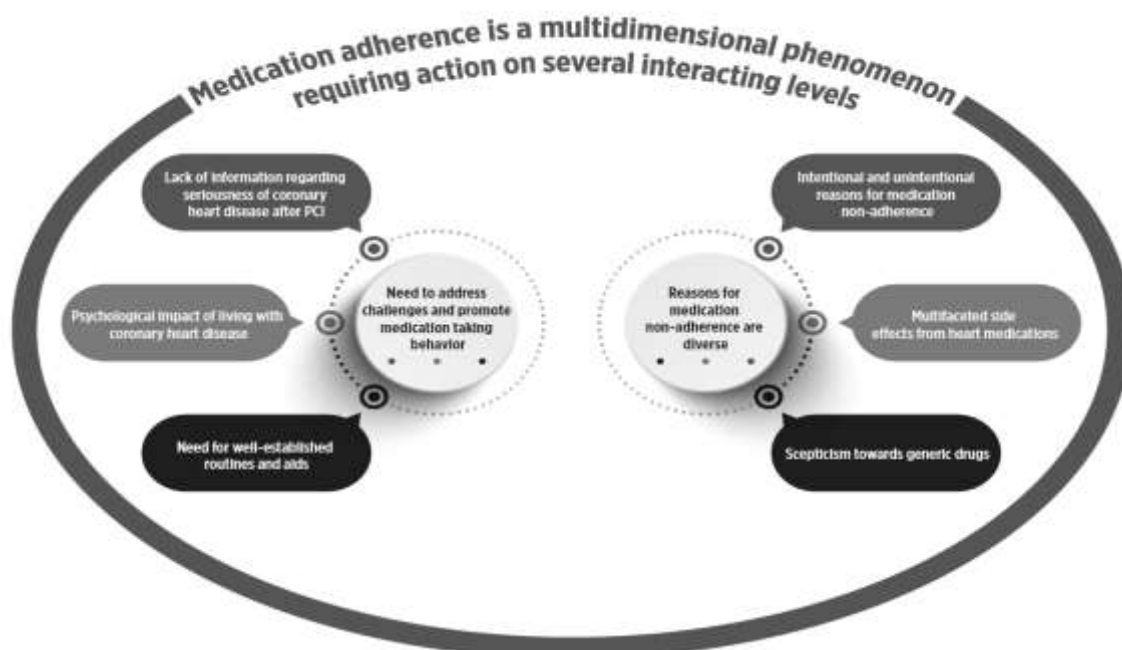
2.5. Ethical considerations

The ethical guidelines of the World Medical Association, Declaration of Helsinki and legislation in Norway guided the study protocol (Declaration of Helsinki, 2008). Written, informed consent was obtained, and participants were informed that they could withdraw from the study at any time without providing an explanation. Data were kept in strict confidence in locked electronic files on the university hospital's research server to protect the participants' privacy. Approval by the Norwegian Regional Committee for Ethics in Medical Research was granted (REK 2015/57).

3. Findings

Patients described different types of challenges in their efforts to adhere to a strict medication regimen. The overarching theme characterising patients' efforts to adhere to their medication regimen was multidimensional, and their efforts required them to take action on different interacting levels. These interacting levels were further characterised by two sub-themes, which could be broken down into six different categories (Figure 1). The findings for patients' experiences in these categories will be presented in turn, with representative quotations from patients (Table 2).

Figure 1. Interacting levels affecting medication adherence



3.1. Intentional and unintentional reasons for medication non-adherence

Patients who experienced few or no problems following PCI more often described their reasons for medication non-adherence in ways that showed they were unintentional. This was especially clear for those who had to take medication twice a day (e.g., ticagrelor); they often forgot their evening dose because they were engaged in other activities.

'I did not always manage to take it [ticagrelor]. It should have been taken twice daily, and that didn't work for me, even though I used a pillbox and everything. Then I see that during the week, ok, I forgot it for four days.' (Woman, 46 years old)

Those who had more problems, such as heart medication side effects or psychological struggles following PCI, described reasons that could be characterised as being intentional.

'I became tired and indisposed and lost my zest for life [from statin treatment]. I started up with rosuvastatin, but after one week I lost all zest for life and wanted to jump off a bridge. So I stopped taking those, and now I feel like I have a lot more energy.' (Man, 43 years old)

3.2. Multifaceted side effects from taking heart medications

There were patients who experienced no side effects from their medication. However, it was more common that patients had some side effects, ranging from minor gastrointestinal discomfort to severe muscle and joint pain, fatigue, and gastric ulcers.

'I became really short of breath from taking metoprolol. Just bending down to put on my shoes before going to work was a struggle. And I became very lethargic; it was like I did not have a motor in my body. I went for walks and hardly knew how to get home. I could not remove a bottle cap, I could hardly drive a car, and my feet were aching so much that I could hardly walk [from statin treatment].' (Woman, 52 years old)

Besides the direct medication side effects, patients also experienced communication problems about side effects. Patients were often dissatisfied with the information they received from physicians at the hospital about potential side effects. They expressed that this was an important subject for them, but it received little attention from their healthcare team. Patients said they had to look up information about side effects in medication information leaflets or seek information on the Internet.

'I talked about side effects. They [physicians at the hospital] did not take me seriously. They told me it is really rare to experience side effects, and that I should not think about it. So I think I talked more about side effects than they did. I was told that I should not believe everything I heard and that very few [people] experienced muscle pain from statins for example.' (Man, 59 years old)

3.3. Scepticism towards generic drugs' efficacy

Patients expressed several reasons for their scepticism towards generic drugs ability to work for them. They reported that generic drugs were second-rate drugs that did not work as well as brand-name drugs. Patients stated that they received no information about generic drugs at the hospital, or were not told of the possibility that their prescribed brand-name medication might be changed to a generic equivalent at the pharmacy. In addition, patients found it confusing when pill colour or shape were different for a brand-name drug and the generic equivalent.

'I think that they [generic drugs] are not good enough. And why have they made it so cheap? Are they substitutions? No, let me stick to what I am used to, because that is proper stuff.' (Woman, 74 years old)

There were patients who experienced side effects when changing from a brand-name drug to a generic drug. Even though this happened for only a particular drug, they generalised this experience and were unwilling to substitute any of their other medications with generic drugs out of fear of experiencing new side effects.

'I do not take generic drugs anymore. I have used it once, and it did not work for me, even though it is supposed to be the same active ingredients. I felt sick and unwell. So, that is why I only use medications I have tried out and know work, no matter the cost.' (Man, 43 years old)

3.4. Lack of information about medications and not acknowledging seriousness of CHD after PCI procedure

Related to their scepticism was that patients felt the medication information they received from physicians and nurses was uninformative and inadequate. They received no or little information about the importance of taking their medication as prescribed, and were told even less about the consequences of failing to adhere to their medication regimen.

'I did not receive any information regarding medications when I was at the hospital — "this is what you should take and this is when you should take it." So, information regarding medications was poor. It was not taken seriously you might say.'

(Woman, 74 years old)

Patients did not always understand what physicians told them about their disease. This led some to search on their own. While still in hospital, there were patients who used information they discovered on the Internet to help them understand what they were being told by their physicians at daily rounds. They searched on their own, because they found it difficult to ask physicians to clarify and elaborate.

Receiving no, or inadequate, information was related to the hectic hospital environment, where physicians were perceived as having too many patients and too little time, both during daily rounds and during the discharge process.

'What you have to understand is that the university hospital is a busy workplace. So at the day of my discharge everything went really fast. I got a discharge letter and was told that there was a pharmacy at the hospital where I had to go. And then she [the discharge physician] said hurriedly that it was heart medication. I think she just read me the discharge letter.' (Man, 76 years old)

Moreover, patients stated that the chaotic, overwhelming situation at the hospital severely hindered them from retaining the information they did receive.

'Of course you need to receive some information when you are discharged, but then again, you might not be able to process the information you receive, because you are not present in the moment.' (Man, 43 years old)

Patients also expressed that healthcare staff did not emphasise enough short- and long-term consequences of missed doses of heart medications, the seriousness of their heart disease, and how they should cope with the disease at home. They suggested that follow-up treatment, such as patient education regarding heart medications and CHD in general, 2-3 weeks after discharge would be beneficial.

3.5. Psychological impact of living with CHD

Patients struggled with anxiety and depression after discharge from the hospital. For those who had participated in a cardiac rehabilitation programme, anxiety and depression became most prominent after they completed the programme. They expressed that it was difficult to suddenly be alone with no one to talk to about their CHD. Furthermore, patients stated that they were in constant fear of experiencing serious side effects from their medication, and they feared experiencing new acute cardiac events.

'I have become more fragile. I cry easily. I am not the tough guy that I used to be.' (Man, 57 years old)

Patients also emphasised that consultations with a psychologist would be important to help them cope cognitively and emotionally with their acute cardiac event and subsequent PCI. They offered the advice that this kind of consultation should be part of any follow-up treatment.

'And this is important. Why are consultations with a psychologist not part of the follow-up treatment?' (Man, 58 years old)

3.6. Need for well-established routines and memory aids

Patients described the new experience of polypharmacy (taking ≥ 5 medications per day²⁸) as being challenging. This was especially the case for those who had to take medications several times per day. Well-established, medication-taking routines, such as taking the pills at the same time and place every day, or having to fill up their pillbox in

advance, were important for patients. They expressed that this helped them adhere to the prescribed medication regimens.

'You make yourself a routine. I have a one-week pillbox, which I refill every Monday, and I keep it where I have all my meals. Then I take my medication in conjunction with my meals. So I will assert that it is extremely rare that I forget my medications.' (Man, 65 years old)

Furthermore, patients stated that the use of a pillbox was necessary to help them organise their medications and remind them to take their pills, a routine that improved their medication adherence.

'Yes, it would not work otherwise [without a pillbox] — not when you are taking four tablets at once.' (Man, 33 years old)

There were patients who set a recurring alarm on their mobile phone to help them remember to take their medications. However, they expressed that this was not always very helpful, as the alarm often went off when they were not at home. When this happened, undoubtedly, they had forgotten about the alarm reminder by the time they got home.

4. Discussion

Patients experienced several challenges when trying to adhere to their medication regimen at home after first-time PCI. These challenges interacted on different levels or dimensions. This was manifested when patients gave reasons for medication non-adherence;

the reasons were characterised as being intentional or unintentional. Patients expressed that the medication information they received from physicians and nurses was uninformative and inadequate. Furthermore, patients regularly experienced side effects from their medications. In addition, patients were sceptical about generic drugs. They found it confusing when the generic pills were different in colour or shape, and had a different name. Therefore, medication adherence was described as a multidimensional phenomenon, which requires action on different interacting levels.

Patients commonly described the information they received about their medication as uninformative and inadequate. They expressed that the hectic hospital environment, one in which physicians were perceived to have too many patients and too little time, contributed to the lack of or inadequate information about their medications. For example, at discharge, patients' stated that the encounter with their physician was too brief and poorly planned. This observation is corroborated by a recent study on the same patient population.²⁹ In addition, a recent position paper concluded that the discharge process should not be an isolated event that begins and ends with the discharge summary, but instead should be a continuous process that starts at admission and develops throughout the hospital stay.³⁰ Furthermore, a fragmented discharge process is putting patients at risk for adverse events and early readmission.³⁰ These findings highlight the notion that factors affecting medication adherence are multifaceted and interactive.²⁵

The chaotic and overwhelming hospital situation also hindered patients from retaining information. Thus, educational sessions two to three weeks after discharge would be beneficial for these patients. Such educational sessions should preferably be held outside of the hospital, as the patients' social context is important when optimising chronic care.³¹ Nurse-led interventions significantly improve appropriate medication use.³² In addition, a focus on patient education and counselling, communication, and achievement of behavioural

change are part of nurses' training programmes, giving nurses the needed skills to implement effective interventions. The nurse-patient relationship established in coronary care units enables nurses to interact and connect with patients, and thereby obtain a deeper understanding of the patients' beliefs or preferences. Hence, utilising ward nurses for patient education in both the discharge process and follow-up care for these patients may be a path worth pursuing.

In contrast to patients who reported intentional reasons for medication non-adherence, patients who reported unintentional reasons experienced few or no problems following PCI. Forgetfulness is reported to be the most common reason for medication non-adherence,³³ and may be the primary manifestation of non-adherence in the year following PCI.¹⁸ For example, those who had to take medications twice daily in the present study often forgot the evening dose due to other activities. Intentional and unintentional non-adherence to some extent overlap, as one is more likely to forget when one is not motivated to take their medication.¹⁸

Decreased motivation for taking medications is common in patients with depressive symptoms. In the present study, there were patients who struggled with anxiety and depression after discharge. A recent systematic review and meta-analysis found that patients exhibiting depressive symptoms following acute coronary syndrome were twice as likely to be non-adherent to medications as those who were not depressed.³⁴ Depression following an acute cardiac event is commonly an adjustment disorder. Unlike major depression, an adjustment disorder is caused by an outside stressor and generally improves spontaneously with comprehensive management.³⁵ This underlines the importance of adopting a holistic person-centred approach in follow-up care for these patients, as well as when developing interventions targeting medication adherence. Thus, interventions should, if possible, target all five levels of the Social Ecological Model to maximise synergies of the intervention for the greatest impact.²⁵

Patients experienced side effects, ranging from minor side effects, like gastrointestinal discomfort, to more disabling side effects, like severe muscle and joint pain, fatigue, and gastric ulcers. Consistent with other studies, patients in the present study who experienced disabling side effects from their medications stated that they intentionally decided not to adhere to their medication.^{7, 13} Those who experienced severe muscle or joint pain ascribed this to statin therapy and stated that this was the reason for treatment discontinuation. Statin-associated muscle symptoms are a common complaint for patients who are prescribed statin therapy.³⁶ However, a recent randomised double-blinded placebo-controlled trial found no remarkable number of reports of muscle-related side effects among patients who were prescribed statin therapy during the blinded phase of the study.³⁷ Thus, a large portion of statin-associated muscle symptoms is suggested to represent musculoskeletal pain unrelated to statin therapy.³⁷

The most common side effect found in the present study were nuisance bleeding (e.g., nosebleeds, bruising), which was ascribed to DAPT. Unlike patients in other studies,^{38,39} patients in the present study did not state nuisance bleeding as a reason for discontinuing DAPT. However, it is worth noting that nuisance bleeding due to DAPT is associated with decreased quality of life.³⁹ According to a recent focus update on DAPT treatment, individually tailored treatment for patients with an increased bleeding risk is possible.⁴⁰ Therefore, it is paramount that healthcare professionals consider side effect profiles of medications and discuss these in plain language tailored to the individual patient, as this may improve health literacy and medication adherence.¹⁴

Side effects from medications are generally assessed in clinical trials. However, assessment is often unstructured and participants are often well-functioning patients. In addition, side effects are often underreported.⁴¹ Thus, side effects documented in clinical trials may not reflect side effects experienced in a heterogeneous real-world population. Therefore,

it is of utmost importance that patients maintain communication with their healthcare professionals about side effects they are experiencing, so that dosages can be adjusted or new alternative drugs can be started.

Patients in the present study were sceptical about generic drugs. If possible, pharmacies in Norway are obliged to offer patients generic drugs. Generic drugs are lower-cost bioequivalents to brand-name drugs. Even though they provide the same clinical benefits, patients believed that generic drugs were not as safe or effective as their brand-name counterparts. Patients also became confused when they switched to generic drugs because the generic pills were different in colour or shape, and had a different name. These findings are consistent with findings in other studies.⁴²⁻⁴⁴ This is concerning, as a recent study indicated that misconceptions about generic drugs can potentially reduce efficacy of the treatment and lead to an increased risk of side effects compared to brand-name counterparts.⁴⁵ A recent systematic literature review concluded that lack of communication between patients and healthcare professionals contributes negatively to views and utilisation of generic drugs.⁴⁶ Supporting this idea, patients who communicated with healthcare professionals about generic drugs were also more likely to accept the use of generic drugs than those who did not. In the present study, patients did not recall receiving information about the possibility of generic drugs when filling their prescriptions. By educating patients and clearly relating drug information, patients' misconceptions and knowledge gaps about the safety and efficacy of generic drugs could have been avoided. Scepticism towards generic drugs is common among physicians also⁴⁷. Therefore, more thoroughly informing physicians about generic drugs may be beneficial as an opinion shaper, which in turn bolsters patients' trust in their physician and will negate their own mistrust of generic drugs.⁴⁷

4.1 Methodological considerations

Credibility, transferability, dependability, and conformability underpin the trustworthiness of qualitative content analysis.²⁷ To achieve credibility, our qualitative content analysis documented what patients found challenging about medication adherence. To ensure we achieved broad variability, we used purposeful sampling and made sure participants differed in demographic characteristics (see Table 1). Since all participants were recruited from the same tertiary university hospital, transferability, beyond the local aspects of the study area, may be somewhat limited. However, this potential limitation may be tempered, since this tertiary hospital is a large university hospital that functions as a regional PCI centre, serving some 700,000 inhabitants. To strengthen dependability, the first author was the only one who conducted interviews and transcribed the interviews verbatim, thus making this aspect consistent. Moreover, at the end of every interview, the first author summarised the content of the interview with the patient to make certain he understood correctly everything communicated. Analyses were performed in close collaboration with the co-authors, who are both experienced with qualitative research methods and the patient group. We are aware of the possibility of bias being introduced because of our pre-understanding of the subject. For this reason, we conscientiously developed the interview guide to gain insight rather than confirmation of our beliefs. Furthermore, the first author had close and frequent conversations with the co-authors to reduce the possibility of misinterpretations of data. Conformability was achieved by following all the recommended steps in the analytical process, as suggested by Graneheim and Lundman.²⁷

5.1. Conclusions and implications

To date, there is no consensus on the best approach to improve medication adherence following early post-discharge after first-time PCI. Findings from the present study that

patients' reasons for non-adherence were multifactorial and interactive indicate that holistic person-centred care may be beneficial in the follow-up of these patients. Utilising ward nurses who have an already-existing relationship with the patients, in both the discharge process and the follow-up care, may be a path to follow when developing interventions to improve medication adherence. Furthermore, shifting towards more holistic person-centred care has the potential of maximising patients' self-care abilities and thereby improving medication adherence.

Conflict of interest

The authors declare no conflict of interest.

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References

1. Windecker S, Kolh P, Alfonso F, et al. 2014 ESC/EACTS Guidelines on myocardial revascularization: The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS) Developed with the special contribution of the European Association of Percutaneous Cardiovascular Interventions (EAPCI). *Eur Heart J*. 2014; 35: 2541-619.
2. Rinfret S, Rodes-Cabau J, Bagur R, et al. Telephone contact to improve adherence to dual antiplatelet therapy after drug-eluting stent implantation. *Heart*. 2013; 99: 562-9.
3. Mentrup S and Schnepf W. The experience and coping of primary coronary intervention: a review of qualitative studies. *Pflege*. 2012; 25: 363-75.
4. Villanueva T. Transitioning the patient with acute coronary syndrome from inpatient to primary care. *J Hosp Med*. 2010; 5 Suppl 4: S8-14.
5. Prvu Bettger J, Alexander KP, Dolor RJ, et al. Transitional care after hospitalization for acute stroke or myocardial infarction: a systematic review. *Ann Intern Med*. 2012; 157: 407-16.
6. Newby LK, LaPointe NM, Chen AY, et al. Long-term adherence to evidence-based secondary prevention therapies in coronary artery disease. *Circulation*. 2006; 113: 203-12.
7. Boggon R, van Staa TP, Timmis A, et al. Clopidogrel discontinuation after acute coronary syndromes: frequency, predictors and associations with death and myocardial infarction--a hospital registry-primary care linked cohort (MINAP-GPRD). *Eur Heart J*. 2011; 32: 2376-86.

8. Allonen J, Nieminen MS, Lokki M, et al. Mortality rate increases steeply with nonadherence to statin therapy in patients with acute coronary syndrome. *Clin Cardiol.* 2012; 35: E22-7.
9. Zimarino M, Ruggieri B and De Caterina R. Patient management and care after primary percutaneous coronary intervention: reinforcing a continuum of care after primary percutaneous coronary intervention. *Am Heart J.* 2010; 160: S42-7.
10. Tegn N, Abdelnoor M, Aaberge L, et al. Invasive versus conservative strategy in patients aged 80 years or older with non-ST-elevation myocardial infarction or unstable angina pectoris (After Eighty study): an open-label randomised controlled trial. *Lancet.* 2016; 387: 1057-65.
11. Shen Q, Karr M, Ko A, et al. Evaluation of a medication education program for elderly hospital in-patients. *Geriatr Nurs.* 2006; 3: 184-92.
12. Delamater AM. Improving Patient Adherence. *Clinical Diabetes.* 2006; 24: 71-7.
13. Swieczkowski D, Mogielnicki M, Cwalina N, et al. Medication adherence in patients after percutaneous coronary intervention due to acute myocardial infarction: From research to clinical implications. *Cardiol J.* 2016.
14. Brown MT and Bussell JK. Medication Adherence: WHO Cares? *Mayo Clin Proc.* 2011; 86: 304-14.
15. Levine GN, Bates ER, Blankenship JC, et al. 2015 ACC/AHA/SCAI focused update on primary percutaneous coronary intervention for patients with ST-elevation myocardial infarction: An update of the 2011 ACCF/AHA/SCAI guideline for percutaneous coronary intervention and the 2013 ACCF/AHA guideline for the management of ST-elevation myocardial infarction: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and

- the Society for Cardiovascular Angiography and Interventions. *Catheter Cardiovasc Interv.* 2016; 87: 1001-19.
16. Ho PM, Magid DJ, Shetterly SM, et al. Medication nonadherence is associated with a broad range of adverse outcomes in patients with coronary artery disease. *Am Heart J.* 2008; 155: 772-9.
 17. De Geest S and Sabate E. Adherence to long-term therapies: evidence for action. *Eur J Cardiovasc Nurs.* 2003; 2: 323.
 18. Molloy GJ, Messerli-Bürgy N, Hutton G, et al. Intentional and unintentional non-adherence to medications following an acute coronary syndrome: A longitudinal study. *J Psychosom Res.* 2014; 76: 430-2.
 19. Rushworth GF, Cunningham S, Mort A, et al. Patient-specific factors relating to medication adherence in a post-percutaneous coronary intervention cohort. *Int J Pharm Pract.* 2012; 20: 226-37.
 20. Uijen AA, Bosch M, van den Bosch WJ, et al. Heart failure patients' experiences with continuity of care and its relation to medication adherence: a cross-sectional study. *BMC Fam Pract.* 2012; 13: 86.
 21. Czarny MJ, Nathan AS, Yeh RW, et al. Adherence to dual antiplatelet therapy after coronary stenting: a systematic review. *Clin Cardiol.* 2014; 37: 505-13.
 22. Levine GN, Bates ER, Bittl JA, et al. 2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines: An Update of the 2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention, 2011 ACCF/AHA Guideline for Coronary Artery Bypass Graft Surgery, 2012 ACC/AHA/ACP/AATS/PCNA/SCAI/STS

Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease, 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction, 2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes, and 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery. *Circulation*. 2016; 134: e123-55.

23. Williams AF, Manias E and Walker R. Adherence to multiple, prescribed medications in diabetic kidney disease: A qualitative study of consumers' and health professionals' perspectives. *Int J Nurs Stud*. 2008; 45: 1742-56.
24. Holt EW, Rung AL, Leon KA, et al. Medication Adherence in Older Adults: A Qualitative Study. *Educ Gerontol*. 2014; 40: 198-211.
25. Stokols D. Establishing and maintaining healthy environments. Toward a social ecology of health promotion. *Am Psychol*. 1992; 47: 6-22.
26. Graneheim UH, Lindgren BM and Lundman B. Methodological challenges in qualitative content analysis: A discussion paper. *Nurse Educ Today*. 2017; 56: 29-34.
27. Graneheim UH and Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today*. 2004; 24: 105-12.
28. Masnoon N, Shakib S, Kalisch-Ellett L, et al. What is polypharmacy? A systematic review of definitions. *BMC Geriatr*. 2017; 17: 230.
29. Valaker I, Norekvål TM, Råholm M-B, et al. Continuity of care after percutaneous coronary intervention. The patient's perspective across secondary and primary care settings. *Eur J Cardiovasc Nurs*. 2017; 16: 444-452.

30. Mennuni M, Massimo Gulizia M, Alunni G, et al. ANMCO Position Paper: hospital discharge planning: recommendations and standards. *Eur Heart J Suppl.* 2017; 19: D244-D55.
31. Nieuwlaat R, Wilczynski N, Navarro T, et al. Interventions for enhancing medication adherence. *Cochrane Database Syst Rev.* 2014: Cd000011.
32. Perk J, De Backer G, Gohlke H, et al. European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice. *Eur Heart J.* 2012; 33: 1635-701.
33. Iuga AO and McGuire MJ. Adherence and health care costs. *Risk Manag Healthc Policy.* 2014; 7: 35-44.
34. Crawshaw J, Auyeung V, Norton S, et al. Identifying psychosocial predictors of medication non-adherence following acute coronary syndrome: A systematic review and meta-analysis. *J Psychosom Res.* 2016; 90: 10-32.
35. Hare DL, Toukhsati SR, Johansson P, et al. Depression and cardiovascular disease: a clinical review. *Eur Heart J.* 2014; 35: 1365-72.
36. Rosenson RS, Baker S, Banach M, et al. Optimizing Cholesterol Treatment in Patients With Muscle Complaints. *J Am Coll Cardiol.* 2017; 70: 1290-301.
37. Gupta A, Thompson D, Whitehouse A, et al. Adverse events associated with unblinded, but not with blinded, statin therapy in the Anglo-Scandinavian Cardiac Outcomes Trial-Lipid-Lowering Arm (ASCOT-LLA): a randomised double-blind placebo-controlled trial and its non-randomised non-blind extension phase. *Lancet.* 2014; 389: 2473-81.

38. Amin AP, Bachuwar A, Reid KJ, et al. Nuisance bleeding with prolonged dual antiplatelet therapy after acute myocardial infarction and its impact on health status. *J Am Coll Cardiol*. 2013; 61: 2130-8.
39. Garavalia L, Ho PM, Garavalia B, et al. Clinician-Patient Discord: Exploring Differences in Perspectives for Discontinuing Clopidogrel. *Eur J Cardiovasc Nurs*. 2011; 10: 50-5.
40. Valgimigli M, Bueno H, Byrne RA, et al. 2017 ESC focused update on dual antiplatelet therapy in coronary artery disease developed in collaboration with EACTS: The Task Force for dual antiplatelet therapy in coronary artery disease of the European Society of Cardiology (ESC) and of the European Association for Cardio-Thoracic Surgery (EACTS). *Eur Heart J*. 2017.
41. Seruga B, Templeton AJ, Badillo FE, et al. Under-reporting of harm in clinical trials. *Lancet Oncol*. 2016; 17: e209-19.
42. Corrao G, Soranna D, Arfe A, et al. Are generic and brand-name statins clinically equivalent? Evidence from a real data-base. *Eur J Intern Med*. 2014; 25: 745-50.
43. Shrank WH, Cox ER, Fischer MA, et al. Patients' Perceptions Of Generic Medications: Although most Americans appreciate the cost-saving value of generics, few are eager to use generics themselves. *Health Aff*. 2009; 28: 546-56.
44. Kesselheim AS, Bykov K, Avorn J, et al. Burden of changes in pill appearance for patients receiving generic cardiovascular medications after myocardial infarction: Cohort and nested case-control studies. *Ann Intern Med*. 2014; 161: 96-103.
45. Faasse K, Martin LR, Grey A, et al. Impact of brand or generic labeling on medication effectiveness and side effects. *Health Psychol*. 2016; 35: 187-90.

46. Howard JN, Harris I, Frank G, et al. Influencers of generic drug utilization: A systematic review. *Res Social Adm Pharm.* 2017.
47. Dunne SS and Dunne CP. What do people really think of generic medicines? A systematic review and critical appraisal of literature on stakeholder perceptions of generic drugs. *BMC Med.* 2015; 13: 173.