



Key factors underlying the willingness of patients with cancer to participate in medication redispensing

E.M. Smale^a, T.C.G. Egberts^{b,c}, E.R. Heerdink^{b,c,d}, B.J.F. van den Bemt^{a,e}, C.L. Bekker^{a,*}

^a Department of Pharmacy, Radboud Institute for Health Sciences, Radboud University Medical Centre, P.O. Box 9101, 6500, HB, Nijmegen, the Netherlands

^b Department of Clinical Pharmacy, Division of Laboratory, Pharmacy and Genetics, University Medical Centre Utrecht, P.O. Box 85500, 3508, GA, Utrecht, the Netherlands

^c Division of Pharmacoepidemiology and Clinical Pharmacology, Utrecht Institute for Pharmaceutical Sciences (UIPS), Faculty of Science, Utrecht University, P.O. Box 80082, 3508, TB, Utrecht, the Netherlands

^d Research Group Innovations of Pharmaceutical Care, Utrecht University of Applied Medical Centre Utrecht, P.O. Box 85500, 3508, GA, Utrecht, the Netherlands

^e Department of Pharmacy, Sint Maartenskliniek, P.O. Box 9011, 6500, GM, Nijmegen, the Netherlands

ARTICLE INFO

Keywords:

Medication waste
Medication redispensing
Medicine reuse
Oncology
Qualitative research
COM-B model

ABSTRACT

Background: Redispensing medication unused by patients to other patients could reduce the environmental burden of medication waste. Simultaneously, associated financial loss could be reduced, particularly for expensive medication such as oral anticancer drugs. An important determinant for successful medication redispensing is patient participation.

Objective(s): To identify key factors underlying the willingness of patients with cancer to participate in the redispensing of unused oral anticancer drugs.

Methods: Semi-structured interviews via telephone or video call were conducted with adult patients diagnosed with cancer from two Dutch hospitals. The interview guide was framed using the COM-B model for behavioural change, to elicit patients' capability, opportunity and motivation to participate in medication redispensing. Questions were related to patients' willingness to accept redispensed medication, reasons thereof, perceived concerns and needs. Inductive thematic analysis was applied.

Results: Seventeen patients (aged 38–82 years, 71% female), with nine different types of cancer participated. The majority of participants supported medication redispensing.

Four categories of key factors underlying the willingness of patients with cancer to participate in medication redispensing were identified. First, the driver for participation was having positive societal impact, relating to affordability and sustainability of healthcare. Second, having trust in product quality was a requirement, influenced by preconceived beliefs, quality assurance and patients' knowledge of this process. Third, a facilitator for participating in medication redispensing was adequate provision of information. This concerned awareness of medication waste, information about medication redispensing, support from healthcare providers and other patients, and insight into medication dispensing history. Last, a convenient process for returning unused medication to pharmacies would facilitate participation in medication redispensing.

Conclusions: The willingness of patients with cancer to participate in medication redispensing relates to a drive for achieving positive societal impact, provided that medication is of high quality, there is adequate information provision and a convenient process.

1. Introduction

Medication waste is a major threat to sustainable medication use, yet it cannot always be prevented. Unused medication can be the result of medication nonadherence or changes in a patient's recommended

treatment, for example due to a lack of effect or adverse events. It has been reported that around one-third of the patients using oral anticancer drugs discontinue treatment early.^{1–5} Half of these patients have redundant medication⁶ that according to current pharmaceutical guidelines must be disposed of due to quality and safety risks.

* Corresponding author. Radboud University Medical Center, Radboud Institute for Health Sciences, Department of Clinical Pharmacy, Geert Grooteplein Zuid 10, 6525, GA, Nijmegen, the Netherlands.

E-mail address: Charlotte.Bekker@radboudumc.nl (C.L. Bekker).

<https://doi.org/10.1016/j.sapharm.2021.12.004>

Received 21 October 2021; Received in revised form 22 December 2021; Accepted 22 December 2021

Available online 25 December 2021

1551-7411/© 2021 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Medication waste burdens the environment through emissions associated with production and distribution, as well as through pollution in case of incorrect medication disposal.^{7–9} Unused medication can also have a high impact on the healthcare budget,^{10–14} particularly in case of expensive medication such as oral anticancer drugs, of which redundant medication packages are worth on average €2600 (€1100 – €5400) per patient in The Netherlands.⁶ Consequently, medication waste does not align with the concept of sustainable pharmacy.

Currently, direct environmental effects of medication waste are mitigated via take-back programs that ensure proper medication disposal via pharmacies. However, both environmentally and economically, it would make more sense to counter medication waste in the first place.¹⁵ For this purpose, circularity could be introduced in the pharmaceutical chain.¹⁶ A circular pharmaceutical chain starts with smarter product use and manufacturing, but if waste cannot be prevented, medication's lifecycle could be expanded by redispensing unused medication. This means that unused medication by one patient could be collected by the pharmacy, and after assurance of pharmaceutical quality, the medication could be redispensed to another patient.^{17–19} Redispensing schemes are in place to help people with limited access to healthcare, for example, in the United States and Greece.^{20–23} Nevertheless, redispensing is not implemented as standard of care due to the concerns regarding counterfeits and improper storage at patients' homes giving rise to legal constrictions in most countries.

Research involving healthcare professionals, national stakeholders and general public established quality monitoring criteria to guarantee quality and safety of medication upon redispensing.^{24–26} Strategies to fulfil the proposed quality criteria have also been suggested, such as supplying medication with tamper-evident seals and sensors that monitor storage conditions.^{27,28} Using extra materials to assure medication's quality upon redispensing would require an initial investment, but could be cost-beneficial for medication with a price exceeding 100 euro per package.²⁹ In fact, for expensive medication, such as oral anticancer drugs, medication redispensing could even contribute to cost-savings. In the Netherlands, oral anticancer drugs are paid for by the healthcare system and supplied to patients free of charge by the outpatient pharmacy. Therefore, cost-savings for the healthcare budget could be an incentive for policy-makers to legalise medication redispensing programs providing that pharmaceutical quality is assured. However, for policies to be adjusted, the limited number of pilot-studies are not sufficient,^{30,31} and a large scale redispensing program that tests the concept in clinical practice is needed.

For a medication redispensing program to be successful in clinical practice, patients must be willing to return unused medication to the pharmacy and accept redispensed medication for their treatment.^{24–26,32,33} Several studies have examined public attitudes towards medication redispensing, including large scale survey studies showing that up to 75% of the participants would use redispensed oral medication if the pharmaceutical quality is assured.^{34–36} In addition, studies explored public beliefs about medication redispensing qualitatively,²⁶ and assessed the effect of quality indicators on people's perceptions regarding medication redispensing.³⁷ What is not yet known however, is the perception of patients with cancer regarding participation in medication redispensing. This information is particularly valuable as oral anticancer drugs are highly eligible for redispensing, given the frequency of their waste and associated financial loss, yet quality of oral anticancer drugs is crucial given the severity associated with the diagnosis of cancer. Consequently, information on patients' willingness is required to inform the potential of redispensing oral anticancer drugs, as well as information on underlying factors, so the design of a redispensing program can be optimised to support patient participation via the use of behaviour change techniques.³⁸ The objective of this study is therefore to identify key factors underlying the willingness of patients with cancer to participate in medication redispensing.

2. Methods

This study employed a qualitative research approach, conducting semi-structured interviews with patients with cancer and treated with oral anticancer drugs. COREQ guidelines were used to assure explicit and comprehensive reporting of qualitative research(S1).³⁹ The study was carried out in accordance with the applicable legislation concerning reviewal by an accredited Research Ethics Committee Radboud University Medical Centre (file number 2020–6740).

2.1. Theoretical framework

The COM-B model of behaviour change was used to guide data collection and analysis as it is a well-known model used for studying factors underlying behaviour related to healthcare interventions, previously used in cancer care.^{40,41} The COM-B model is a systematic method that describes behaviour (B) as the interaction between three components: capability (C), opportunity (O) and motivation (M).³⁸ Firstly, capability describes an individual's physical and psychological capacity to participate in a certain behaviour. Secondly, opportunity refers to external influences, including social and physical factors, that make behaviour possible or prompt it. Thirdly, motivation defines psychological processes that stimulate an individual to participate in a certain behaviour, which can be automatic (emotions) or reflective (beliefs and intentions).

Participating in medication redispensing can be seen as a behaviour. The COM-B model can help to understand this behaviour by providing a structured overview of underlying components, while it also provides a link to evidence-based behaviour change techniques via the Behaviour Change Wheel.³⁸ Success of implementation of a medication redispensing depends significantly on the behaviour of participants. Accordingly, by identifying effective behavioural components to overcome barriers perceived by participants, behaviour change techniques could help to optimise development and implementation of a medication redispensing program. Consequently, the COM-B model was used to guide the understanding of key factors underlying the willingness of patients with cancer to participate in medication redispensing, supporting the design of a medication redispensing tailored to patients' needs.

2.2. Participants

The study was conducted between August–December 2020 with patients from an academic hospital (Radboud university medical center Nijmegen) and a teaching hospital (St. Antonius Hospital Utrecht) in the Netherlands. Adult patients (≥ 18 years) with a clinical diagnosis of cancer who had used an oral anticancer drug in the past six months were eligible for inclusion. Terminally ill patients and patients that were not able to communicate in Dutch were excluded.

A medical specialist in oncology care (medical oncology, haematology or lung oncology) invited patients for participation during routine consultation. Interested patients received written information, informed consent and a short questionnaire, which could be returned free of charge by post. The questionnaire contained the following items: socio-demographics (age, gender, living situation, educational level and ethnicity), disease (indication, oral anticancer drug type and duration of treatment) and willingness to use redispensed medication. By using purposive sampling, it aimed to obtain a maximum variation sample based on the items stated above. This was executed by actively inquiring underrepresented groups of patients based on socio-demographic and disease-related items, assuming that this would correlate to diversity in their willingness to use redispensed medication.⁴² Patients who provided written informed consent were subsequently interviewed.

A week before the interview, participants received sensitizing questions via post(S2). These regarded their perspective on redispensing medication, their willingness to use redispensed medication, needs and

facilitators for using redispensed medication and preferences for returning unused medication to the pharmacy. This sensitizing concept was used to introduce the topic beforehand, to enhance the quality and quantity of the patient's input during the interview.⁴³ Participants had the opportunity to withdraw from the interview after receiving these questions.

2.3. The interview

The research team developed a semi-structured interview guide, which was reviewed by two patient representatives (S2). Each interview started with an introduction, followed by an opening question to make the participant at ease. The opening question related to ever having leftover medication after discontinuation of any previous treatment. Subsequently, quality criteria for medication redispensing, previously determined by qualitative research among stakeholders^{24,25} and the general public²⁶ were presented. This included: 1) medication is still enclosed in the original package that protects it for influences of humidity and light within a sealed outer package, 2) medication has a remaining shelf-life of ≥ 6 months, and 3) medication has been stored according to manufacturer's recommendations (monitored with a temperature sensor). Subsequently, participants were asked about their general view on medication redispensing, willingness to participate in medication redispensing, reasons thereof and strategies to support patient participation, while mimicking the situation in the pharmacy as close as possible. To elicit factors that could support patient participation, each question included a range of probes based on the COM-B model, such as information, financial support, support from healthcare professionals and family.

Interviews were conducted via telephone or via a secured online conferencing platform, depending on participant's preference. All interviews were conducted in Dutch by a trained interviewer (ES), who is a female pharmacist, employed as PhD-candidate in the research topic. The first two interviews were used to pilot-test the interview guide to ensure appropriateness and to familiarise with the questions. The guide was further improved in an iterative process, in which questions regarding persuasion and the influence of patients' diagnosis were added. All interviews were audio-recorded, and field notes were made during the interviews. Participants received a €12.50 gift voucher for participation by mail. Data saturation was identified as new data being merely a repetition of previous themes and comments, determined by two researchers (ES and CB). After achieving data saturation, two more interviews were conducted for confirmation of data saturation.⁴⁴

2.4. Data analysis

Interviews were transcribed verbatim and anonymised. To contribute to the internal validity of the data, participants received the transcript to verify the correctness and completeness.⁴⁵ Two patients replied to this e-mail with an additional statement, which was later added to the transcripts.

A thematic content approach was used to identify, analyse and interpret the meaning of new constructs in the context.⁴⁶ Data was analysed with the software program Atlas.ti. The initial open coding was performed by two researchers (ES and CB) who coded eight transcripts independently. Discrepancies were discussed until consensus was reached. Subsequently, ES coded the remaining transcripts, reviewed by CB, and discrepancies were again resolved by consensus. Frequently-used codes were grouped by ES and reviewed by CB to generate a collated list of axial codes. These codes were compared and contrasted to seek connections between emerging codes. Identified themes and associated codes were then intensively discussed with the research team, until all agreed with the final themes. Quotes that reflected the content of the data were selected and translated to English by ES in collaboration with CB, checked by a native English speaker for correctness.

Emerging themes were deductively analysed by comparing them to the domains of the COM-B framework. This was executed by two researchers (ES and CB), discussed with another researcher (BB), and then discussed with the research team until consensus on an overview of key factors underlying the willingness of patients with cancer to participate in medication redispensing was reached.

3. Results

In total, eighteen patients were interested to participate, one of whom had second thoughts on participating without a specified reason. Seventeen patients returned the questionnaire and were interviewed, including one participant that was accompanied by a partner. Four interviews (24%) were conducted via a secured online conferencing platform and thirteen interviews (76%) via telephone. The interviews had a median duration of 27 min (range: 13–47 min).

Participants' characteristics are summarised in Table 1. Participants had a median age of 67 years (range 38–82 years) and twelve participants were female (71%). Fourteen of the patients lived together with a partner (82%), whereas 3 (18%) patients lived alone. Educational level of patients was stated as low (24%), middle (47%) or high (29%). All participants had a Caucasian background. In total, nine different cancer diagnoses were represented, for which participants used fourteen different types of oral anticancer drugs. Treatment duration varied from several weeks to multiple years. The majority of participants (82%) reported that they were willing to participate in medication redispensing.

Four categories of key factors underlying the willingness of patients with cancer to participate in medication redispensing were identified (Fig. 1), including having a positive societal impact (driver), having trust in product quality (requirement), adequate provision of information (facilitator) and a convenient process (facilitator).

3.1. Driver: having positive societal impact

The majority of participants have had leftover medication and expressed frustrations about disposing unused medication because they perceived it as wasteful and a loss of resources. Accordingly, some participants previously contributed to waste-minimising activities, including donation and off-the-record redispensing programs.

"In fact you are throwing away good things. That really bothers me". – P1

"There once was a campaign by a doctor who was working in Africa and he said that he could use all leftover medication. Then I said to my wife: 'Shall we give it to them, because this is just not right?'" – P11

"I had leftover medication the first time I received chemotherapy. I returned it to the department. They were like: it's actually not allowed, but occasionally, if people require one or two tablets, we use them". – P17

In general, participants were willing to participate in medication redispensing due to a strong desire to have a positive societal impact by combatting the burdens of medication waste. This related to a desire to increase affordability of healthcare and contribute to sustainable healthcare.

Increasing affordability of healthcare

Realising cost-savings for the healthcare budget was the main motivator for participants to participate in medication redispensing. They argued that with the rising healthcare costs, there is an urgent need to use available resources effectively to ascertain affordability of healthcare. Consequently, participants appointed countering the unnecessary financial loss associated with wasting unused medication as driver for participating in medication redispensing.

"Because everything is so expensive. Healthcare is becoming really expensive. And if we can make it somewhat cheaper in this way, provided

Table 1
Participants' characteristics (n = 17).

Patient	Age	Gender	Hospital	Diagnosis	Oral anticancer drug in use/used	Willing to participate in redispensing?
P1	69	F	R	Ovarian cancer	Olaparib (Lynparza)	Yes
P2	51	F	R	Sarcoma	Pazopanib (Votrient)	Yes
P3	74	F	R	Cervical cancer	Medroxyprogesterone (Provera)	Yes
P4	51	F	R	Melanoma	Trametinib (Mekinist) Dabrafenib (Tafinlar)	Not sure
P5	71	M	R	Renal cell cancer	Cabozantinib (Cabometyx)	Yes
P6	64	F	R	Lung cancer	Crizotinib (Xalkori)	No
P7	70	F	R	Lung cancer	Alectinib (Alecensa)	Yes
P8	73	F	R	Lung cancer	Alectinib (Alecensa)	Yes
P9	75	F	R	Lung cancer	Osimertinib (Tagrisso)	Yes
P10	67	M	R	Multiple myeloma	Lenalidomide (Revlimid)	Yes
P11	64	M	R	Multiple myeloma	Lenalidomide (Revlimid)	Yes
P12	69	M	R	Lung cancer	Osimertinib (Tagrisso)	Yes
P13	38	F	S	Breast cancer	Palbociclib (Ibrance)Fulvestrant (generic)	Yes
P14	56	F	S	Breast cancer	Capeticabine (generic)	Yes
P15	82	M	S	Prostate cancer	Abiraterone (Zytiga)	No
P16	56	F	S	Breast cancer	Palbociclib (Ibrance)Fulvestrant (generic)	Yes
P17	63	F	S	Breast cancer	Capeticabine (generic)	Yes

F = female; M = male; R = Radboud university medical center (academic hospital); S = St. Antonius hospital (teaching hospital).

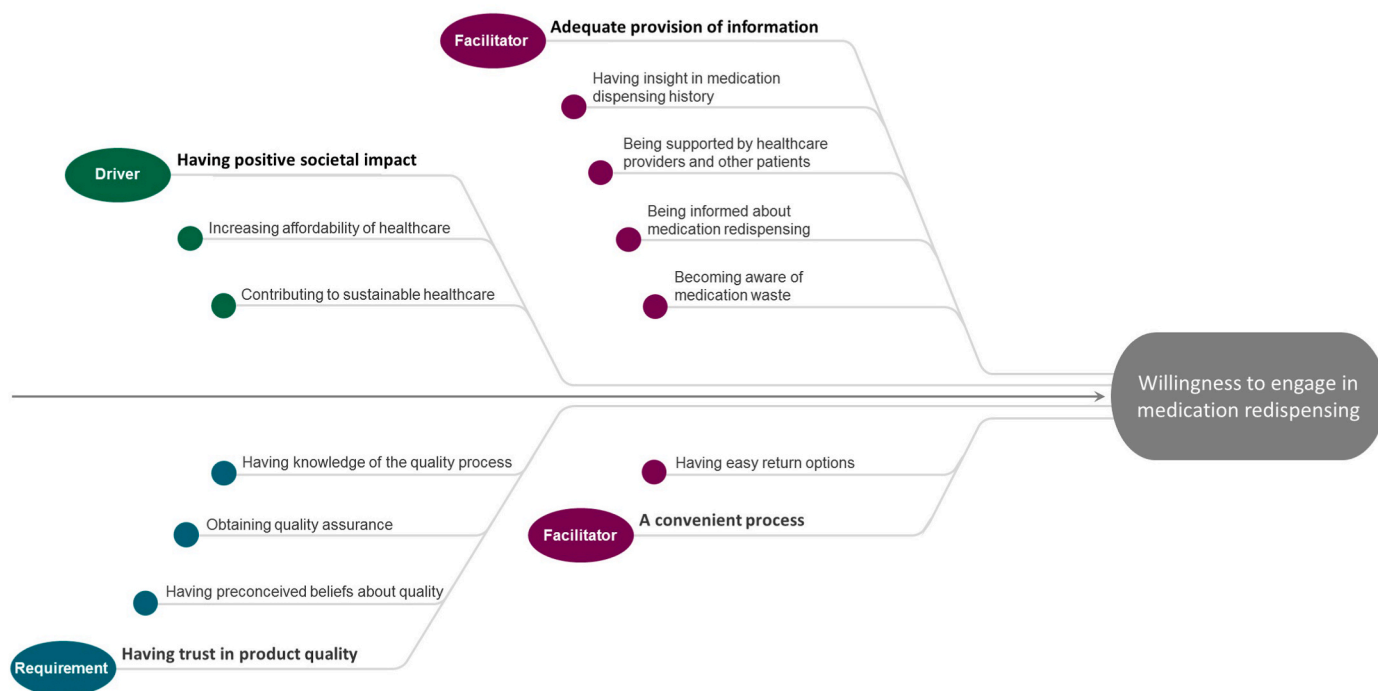


Fig. 1. Schematic presentation of themes with corresponding key factors underlying patients' willingness to participate in medication redispensing.

that it is safe of course, then I'm completely in favour of that, it's cost-effective or at least saves a lot of money." – P7

Participants were aware of the high treatment costs for oncology care and expressed gratitude for receiving this treatment. Therefore, they were motivated to recompense the healthcare budget by participating in medication redispensing.

"I'm very grateful to everyone that I can use such expensive medication, because, yes it's life-saving. So, it's worth so much to me. Then I think it's a shame to just destroy medication, especially if it's worth so much money. That's such a shame, because it could also help someone else. The healthcare costs may not disappear, but maybe we can reduce them slightly". – P1

Moreover, few participants argued that increasing affordability of healthcare could contribute to medication availability, which further motivated them to participate in medication redispensing.

Contributing to sustainable healthcare

Contributing to sustainable healthcare was also a driver for participating in medication redispensing, as, according to participants, medication redispensing could counteract the environmental burden related to manufacturing new medication and incorrect medication disposal.

"... if so many things must be newly produced, it also creates waste products and that's bad for the air." – P1

"... when I hear and read what people flush down the sewer, now that's just scandalous! That's not what medication is intended for. Return it to the pharmacy. In that way, I, for myself, have the feeling that it will not end up in the environment." – P15

3.2. Requirement: having trust in product quality

Trust in the pharmaceutical quality of redispensed medication

appeared an important requirement underlying participants' willingness to participate in medication redispensing. Participants' trust in product quality was based on preconceived beliefs about quality, influenced by quality assurance and knowledge of the quality process.

Having preconceived beliefs about quality

Preconceived beliefs about product quality varied between participants. Some participants perceived the pharmaceutical quality of redispensed medication as similar to new medication; hence they expressed willingness to participate in medication redispensing.

"For me there's no difference. It's the same medication, the same brand, the same dose. Both boxes are sealed. So, I don't see the difference in choosing the new one". – P16

On the other hand, some participants expressed concerns about product quality, causing doubts about participating in medication redispensing. These doubts were enforced by participants' diagnoses and fear of disease progression, demanding medication of optimal quality.

"That you don't want to use it, might also be due to that cancer medication is of course fighting for your life. That's why you actually only want the best of the best. What could be possible is to then think: 'I don't trust it completely', well, in that case it's difficult". – P13

Quality concerns related to the possibility of incorrect storage or tampering, as it was argued that a quality monitoring process might be prone to limitations, such as human errors.

"I think I can't be convinced, because there will always be a devil on my shoulder. And you know, if it becomes mandatory ..., I can't do anything about it. But then I would be bothered by it. I would use it with mixed feelings". – P6

"... Maybe mistakes are occasionally being made in the quality checks. People check it, and people make mistakes too". – P6

Obtaining quality assurance

To overcome these quality concerns, most patients endorsed the presented quality monitoring criteria, relating to verification of the medication's seal, shelf-life and storage conditions. Additionally, to assess the possibility of tampering, a few participants suggested that the pharmacy could check the background of the patient returning medication. This included information on the reliability of the individual, as well as checking the reasons for returning the medication.

"You haven't attended the entire process yourself. Look, ...if I would know who took the medication before then maybe that would help". – P6

Most participants appointed pharmacies as a trustworthy executor for medication redispensing. This originated from pharmacies' expertise in medication and experiences with thorough medication checks, together with a general trust in pharmacists acting in an ethical way according to professional standards. Therefore, participants argued that a quality control process by the pharmacy would increase their willingness to participate in medication redispensing.

"I am fully confident about that. Broadly stated, in science. I mean a pharmacist is in my opinion a highly-educated chemist, let's put it that way. Who, I think, will work according to protocols. And that he will draw his conclusions in good conscience as well". – P11

Having knowledge of the quality process

Overall, participants emphasized a need for knowledge of the quality monitoring process, as this could enable trust in product quality and facilitate a well-advised decision regarding participation in medication redispensing.

"And how they can check it, yes, I'd like to know a little more about that, to be able to understand it a little bit, to then think: 'well, that might be okay!' ". – P1

3.3. Facilitator: adequate provision of information

Providing adequate information on medication waste and redispensing could facilitate patient participation, according to participants. Several themes to be communicated were suggested.

Becoming aware of medication waste

According to some participants, the extent and impact of medication waste must be communicated to patients, since awareness of this problem could stimulate participation in redispensing.

"I can imagine that you'd use a sort of campaign for a while, to make people aware. Alerting people, like: 'hey, this is what we are all wasting!'. People will be impressed if they knew what is thrown away regarding medication. That really is the case, at least the first time that I heard of this, I thought: 'this is really major!' ". – P17

Although defining medication costs could help to communicate the impact of medication waste, participants argued that patients could feel burdened by using the medication in the first place. Therefore, healthcare providers must be careful with applying this strategy, as this could stimulate or discourage participation in medication redispensing.

"... if you provide a patient insight in the costs, the disadvantage could be that a patient feels burdened. If I know that my medication is really expensive, you can start to feel burdened, like: 'oh I'm using this medication, and that costs society a lot of money' ". – P2

Being informed about medication redispensing

Most participants pleaded that patients must be pro-actively informed about participating in medication redispensing and elaborated on how this information could be provided. For instance, some participants suggested a general letter or flyer, because it allows patients to carefully (re)read information at home. However, it was also argued that information must be appealing so as not to be lost in the large amounts of information patients already receive. Therefore, information must be vivid and concrete, for example by using short and catchy phrases or modern media tools.

"Yes, and I think that the text should not be too long. Rather something like: box unopened? Bring it back! Or something like that. Or a catchy text, like: 'medication box unopened, bonus' ". – P2

"I also think of a look into the process beyond the scenes. Checking the medication. Of course with videos or tik-toks. Yes. What's happening before the medication is dispensed and what after, how is this verified. That people are able to see this". – P13

In addition, participants argued that a combination of communication strategies promoting participation in medication redispensing should be endorsed, because every strategy is accompanied with its own benefits and repetitive exposure via different media could increase impact of the message. Suggested strategies included a general letter, flyers, posters, (animation) videos, promotion via local media and a national campaign.

Being supported by healthcare providers and other patients

Support of healthcare providers was a requirement for participating in medication redispensing to some interviewees. For this purpose, they suggested inquiring about medication redispensing with healthcare providers, facilitating feedback to patients' questions and concerns. Oncologists and outpatient pharmacists were most-frequently mentioned for consultation. Participants' reasons for consulting

oncologists related to a well-established relationship and the status associated with their position, whereas reasons for consulting outpatient pharmacists related to their expertise of medication. Likewise, specialised nurses could provide information, since some participants described them as easily-approachable. Whoever provided the information, healthcare professionals must collaborate and communicate uniformly according to participants in order to stimulate participation in medication redispensing.

Moreover, a few participants were interested in the number of patients participating in medication redispensing, as patient support can determine the success and impact of medication redispensing. Therefore, these participants declared to be more interested to participate in medication redispensing in case of high patient support.

“Well, I’d be curious, but that’s just curiosity, how many people are indeed inclined to use those unopened boxes that have been returned, because if no one else wants it, then it doesn’t establish much effect ... And if a lot of people want it, I am of course extra stimulated to return my medication”. – P1

Having insight in medication dispensing history

Views regarding transparent communication upon distribution of redispensed medication conflicted. Some participants advocated informing patients about receiving redispensed medication, as this contributes to patients’ trust in medication redispensing, increasing patients’ willingness to participate. Furthermore, these participants perceived obliging participation or not being transparent about it as morally objectionable, and argued that this could cause emotional distress and increase patients’ burden.

“Well, because it’s already hard enough, especially in our case, to have cancer ... And I know that quite a lot of people will protest for receiving another brand of medication, so possibly this may be difficult too. You shouldn’t make it harder for yourself than necessary. If you’re not comfortable with it, you shouldn’t have to”. – P13

Other participants countered this, arguing that product quality is indistinguishable after the pharmacy’s check, thus, patients are not disadvantaged when receiving redispensed medication and do not need to know. Moreover, it was argued that due to human nature patients will rather choose certainty, hence picking new medication over redispensed medication. This could undermine the effect of redispensing. Therefore, these participants proposed a national policy in which patients could occasionally receive redispensed medication of verified quality. They argued that national guidelines could contribute to normalisation of the concept, resulting in no need for patients’ consent to use redispensed medication. Accordingly, a trustable system could be created, while the effect of medication redispensing is maximised.

“You just have to organize it nationally, not per pharmacy. Look, if you leave the choice to the patient, then I think 95% of the patients will choose the unopened or new medication, because they don’t want to risk anything. Because everyone sees a small risk, like I just described”. – P12

3.4. Facilitator: a convenient process

Finally, participants mentioned that patients are more likely to participate in medication redispensing if the process is convenient for them, relating to an easy return process.

Having easy return options

Returning leftover medication to the outpatient pharmacy might require an additional hospital visit with accompanied costs for travelling and parking, according to some participants arguing that patients must be compensated. Furthermore, a minority of participants expressed doubts about patients’ ability to return medication in case of an

exacerbation, relating to physical illness as well as the disappointment associated with failure of treatment.

To overcome these concerns, participants suggested various factors that could support the return of unused medication, including personal reminders (e.g., stickers, flyers, a general message from the hospital or a personal email) and logistical support (e.g., pick-up service, disposal during subsequent hospital visit or close to home). Moreover, since it is human nature to focus on one’s own benefit, some participants pleaded that incentives could encourage the return of unused medication. Small incentives, such as a discount on products from the pharmacy, could make a big difference for patients. Other participants opposed this view, as they believed that participating in medication redispensing should depend on trust and information provision rather than finances.

“People are really focussed on getting something back, or some kind of saving system. ... imagine that you create a reward-system, so after achieving a certain amount of credit you receive something for free. Yes, that might sound like the supermarket, but people are sensitive to such things”. – P2

“I don’t think you should convince people through compensation ... I think people should make a choice based on trust. And don’t let finances decide”. – P6

3.5. Key factors mapped to the COM-B model

To create targets for supporting patients’ participation in medication redispensing, identified key factors were mapped to the COM-B model (Table 2).

4. Discussion

This qualitative study identified four key factors underlying the willingness of patients with cancer to participate in medication redispensing. Patients with cancer expressed a drive to participate in medication redispensing due to a desire to have a positive societal impact, while having trust in product quality was a key requirement for participation. Facilitators included adequate provision of information and a convenient process. The identified key factors related to patient’s capability, opportunity and motivation to participate in medication redispensing.

Patients with cancer expressed a positive attitude towards participating in medication redispensing. Interestingly, the drive to participate in medication redispensing was external (referring to society and environment), while the costs of participation were expected to come at the individual’s own price (referring to inferior quality or increased effort). This was supported by a previous study that highlighted the dichotomy

Table 2
Key factors underlying the willingness of patients with cancer to participate in medication redispensing mapped to the COM-B model.

COM-B component	COM-B sub-component	Key factor underlying the willingness of patients with cancer to participate in medication redispensing
Capability	Psychological	Having knowledge of the quality process
		Becoming aware of medication waste
		Having insight in medication dispensing history
Opportunity	Physical	Having easy return options
	Physical	Obtaining quality assurance
	Social	Having easy return options
Motivation	Automatic	Being supported by healthcare providers and other patients
		Being informed about medication redispensing
		Increasing affordability of healthcare
		Contributing to sustainable healthcare
	Automatic	Having preconceived beliefs about quality

in people's perceptions of redispensed medication, in which people's beliefs favouring medication redispensing mainly related to social and economic benefits, while disadvantages include potential effects on an individual's health.³² This trend is well-known in the field of sustainable consumer behaviour, known as the self-other trade off, but has not yet been defined to influence patient participation in medication redispensing.⁴⁷ Still, underlying themes are consistent with previous research regarding medication redispensing,²⁶ indicating that patients prioritize entities outside themselves over personal wants when considering medication redispensing.

The current study determined requirements and facilitators that could support patients with cancer in participating in medication redispensing, mapped to the COM-B model. It showed that patients with cancer could approve of the quality monitoring criteria established by the general public²⁶ and involved stakeholders.^{24,25} Correspondingly, the presented results support the idea of not merely performing a visual check by the pharmacy, but also using sensors to monitor medication storage conditions prior to redispensing.^{27,28,37,48} In addition, it was identified that a convenient process and adequate information could support patients to participate in medication redispensing. This provides interesting leads for the design of a redispensing program, for which the Behaviour Change Wheel could identify appropriate behavioural interventions informed by the COM-B model.³⁸ For instance, an easy return process was identified as a physical opportunity, corresponding to the following interventions in the Behaviour Change Wheel: coercion, incentivization and persuasion. Incentivization (i.e. creating expectation of reward) and persuasion (i.e., using communication to induce feelings or stimulate action) were indeed strategies suggested by some participants in this study to overcome this challenge. One must be aware of acceptability of such interventions, for example coercion (i.e., creating expectation of punishment or cost) was previously assessed as an unacceptable intervention for promoting the return of unused medication.⁴⁹ Nevertheless, in this way the Behaviour Change Wheel could provide potential targets for developing behavioural interventions promoting patients' willingness to participate in medication redispensing. Another advantage of using the Behaviour Change Wheel is that it provides a link to supportive policy functions, such as guidelines, regulation and legislation. Currently, these functions hinder wide implementation of medication redispensing. For example, in Europe, the logistics of medication redispensing are challenged by the Falsified Medicine Directive (2011/62/EU) that forces tracking of medication packages through the pharmaceutical chain.⁵⁰ In the United Kingdom medication redispensing was forbidden by law, but redispensing was temporarily permitted to combat drug shortages during Covid19, showing that legislation of medication redispensing is possible.^{51,52} Until then, research could help to urge policy-makers by providing assurance of pharmaceutical quality upon redispensing and showing the effects that can be established with an operational medication redispensing program.

Although the findings of this study indicate clear directions for a redispensing program for oral anticancer drugs in clinical practice, the need for facilitating insight in medications' dispensing history to patients remained unresolved. While some participants pleaded for transparency based on emotional grounds, others rejected this based on equal product quality, arguing that transparency could undermine the impact of medication redispensing. Previous research quantifying participants' view on medication redispensing found that the majority of participants wanted to be informed about receiving redispensed medication.³⁶ One solution to this problem could be to provide an opt-out system.³³ This would allow patients that feel emotionally burdened to withdraw from medication redispensing, overcoming ethical concerns. However, in such a system there is an increasing necessity to incentivize participation in medication redispensing, as its impact is depended by the number of participants. The facilitators identified in this study could be utilized for this purpose, including topics as awareness of medication waste, information on medication redispensing, support of healthcare

providers and other patients, as well as a convenient process.

To the authors' knowledge, this study is the first to map the willingness of patients with cancer to participate in medication redispensing. Since oral anticancer drugs are among the most eligible candidates for redispensing from a financial perspective, particularly the view of patients with cancer is valuable for bringing medication redispensing into practice. Another strength of this study is the employment of a sequential dual data analysis, in which themes were inductively identified before the COM-B model was used to organise the data. By determining the themes inductively, influences of the theory's presumptions were minimised, while the use of the COM-B model enhanced rigor of data analysis and can provide insight into behavioural targets required for participation in medication redispensing.

Some limitations should be acknowledged. First, for pragmatic reasons, telephone and conference calls were utilized to conduct interviews. A disadvantage is that transmission of non-verbal information is limited and less social connection can be facilitated via these media. This might also have contributed to a generally brief interview duration, which could have undermined collection of in-depth information. Notwithstanding, the point at which new data was merely a repetition of previous themes and comments was achieved, suggesting thematic saturation.⁴⁴ Moreover, telephone and conference calls allowed participants to have the convenience and privacy of their home setting during the interview, facilitating a safe and more anonymous environment for open conversation, which is particularly valuable for vulnerable patients such as patients with cancer. Secondly, as is reflected by the high proportion of participants reporting a positive attitude, a selection bias may have been caused by patients with a positive attitude towards participating in medication redispensing being more interested in participating in an interview regarding the subject. Despite efforts of purposive sampling, no participants with a non-Caucasian background were recruited in this study. This may have caused a bias, since previous research showed that participants with a non-Dutch cultural background were less willing to use returned medication.³⁴ Nonetheless, deviant opinions were also represented in the data and no distinctions in key factors underlying willingness to participate in medication redispensing were found. Finally, here the focus lies on patients with cancer using expensive medication. It could be argued that patients treated with oral anticancer drugs are more aware of the costs associated with their treatment and therefore are more willing to participate in medication redispensing. Moreover, a note of caution is due as the current study was conducted in the context of a 'Free Prescription' Healthcare System, where individuals do not personally benefit from medication redispensing. Although it could be hypothesised that in other healthcare systems intrinsic motivation to participate in medication redispensing could increase, willingness to participate in medication redispensing in a 'Free Prescription' Healthcare System was found to be particularly high,³⁶ limiting generalizability of these results. Still, in surveys participants expressed broad support for redispensing tablets and capsules in general, also if medication is non-expensive.³⁶ Therefore, it would be interesting to check the current findings with other patient groups using eligible medication for redispensing.

Overall, this study demonstrated a strong drive of patients with cancer to achieve a positive societal impact by participating in the redispensing of oral anticancer drugs. Moreover, it identified requirements and facilitators to support patient participation. The findings of this study contributed to the design of a redispensing process tailored to the needs of patients with cancer that is currently evaluated in a multicentre clinical trial.⁵³ In turn this could facilitate a novel strategy for counteracting medication waste, supporting more sustainable use of medication.

5. Conclusions

This study shows that the willingness of patients with cancer to participate in medication redispensing is driven by achieving positive

societal impact, while there is a need for high-quality medication, adequate information provision and a convenient process. Future interventions that increase capability, opportunity and motivation of patients with cancer could support willingness to participate in medication redispensing, to contribute to more sustainable use of medication.

Author statement

Smale EM: Conceptualization; Methodology; Project administration; Data curation; Investigation; Formal analysis; Interpretation of findings; Visualization; Writing - original draft.

Egberts TCG: Conceptualization; Methodology; Interpretation of findings; Writing - review & editing.

Heerdink RH: Conceptualization; Methodology; Interpretation of findings; Writing - review & editing.

Van den Bemt BJB: Conceptualization; Methodology; Supervision; Interpretation of findings; Writing - review & editing.

Bekker CL: Conceptualization; Funding acquisition; Methodology; Supervision; Validation; Formal analysis; Interpretation of findings; Writing - review & editing.

Declarations of interest

None.

Funding

This work was supported by the ZonMw program Rational Pharmacotherapy [grant number: 848018008].

Acknowledgements

The authors acknowledge all healthcare providers that mediated patient recruitment, including Ingrid Desar, Michel van den Heuvel, Lenneke van Groningen, Marye Boers-Sonderen from the Radboud university medical center and Desirée Burgers, Marleen van Brussel, Mariëtte Agterof, Carola Weerman and Leontine Nederend from the St. Antonius hospital. In addition, the authors would like to thank Patrick Graman for his linguistic feedback on this manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.sapharm.2021.12.004>.

References

- Murphy CC, Bartholomew LK, Carpentier MY, Bluethmann SM, Vernon SW. Adherence to adjuvant hormonal therapy among breast cancer survivors in clinical practice: a systematic review. *Breast Cancer Res Treat*. 2012;134(2):459–478.
- Anderson KR, Chambers CR, Lam N, et al. Medication adherence among adults prescribed imatinib, dasatinib, or nilotinib for the treatment of chronic myeloid leukemia. *J Oncol Pharm Pract*. 2015;21(1):19–25.
- Escudero-Vilaplana V, Revuelta-Herrero JL, Collado-Borrell R, et al. Oral antineoplastic agents: assessment of safety and dose adjustments in clinical practice. *Expert Opin Drug Saf*. 2019;18(9):861–868.
- Hershman DL, Kushi LH, Shao T, et al. Early discontinuation and nonadherence to adjuvant hormonal therapy in a cohort of 8,769 early-stage breast cancer patients. *J Clin Oncol*. 2010;28(27):4120–4128.
- Doshi JA, Jahnke J, Raman S, et al. Treatment utilization patterns of newly initiated oral anticancer agents in a national sample of Medicare beneficiaries. *J Manag Care Spec Pharm*. 2021;27(10):1457–1468.
- Bekker CL, Melis EJ, Egberts ACG, Bouvy ML, Gardarsdottir H, van den Bemt BJB. Quantity and economic value of unused oral anti-cancer and biological disease-modifying anti-rheumatic drugs among outpatient pharmacy patients who discontinue therapy. *Res Soc Adm Pharm*. 2019;15(1):100–105.
- Belkhir L, Elmehri A. Carbon footprint of the global pharmaceutical industry and relative impact of its major players. *J Clean Prod*. 2019;214:185–194.
- Fick J, Söderström H, Lindberg R, Phan C, Tysklind M, Larsson J. Contamination of surface, ground, and drinking water from pharmaceutical production. *Environ Toxicol Chem/SETAC*. 2009;28:2522–2527.
- Kusturica M, Tomas A, Sabo A. Disposal of unused drugs: knowledge and behavior among people around the world. *Rev Environ Contam Toxicol*. 2016;240:71–104.
- World Health Organization. *Pricing of Cancer Medicines and its Impact*. Geneva. 2018. Contract No.: Licence: CC BY-NC-SA 3.0 IGO.
- Leung CYW, Cheung MC, Charbonneau LF, Prica A, Ng P, Chan KKW. Financial impact of cancer drug wastage and potential cost savings from mitigation strategies. *J Oncol Pract*. 2017;13(7):e646–e652.
- Monga V, Meyer C, Vakiner B, Clamon G. Financial impact of oral chemotherapy wastage on society and the patient. *J Oncol Pharm Pract*. 2019;25(4):824–830.
- Fasola G, Aita M, Marini L, et al. Drug waste minimisation and cost-containment in Medical Oncology: two-year results of a feasibility study. *BMC Health Serv Res*. 2008;8:70.
- Matti N, Delon C, Rybarczyk-Vigouret MC, Khan GM, Beck M, Michel B. Adherence to oral anticancer chemotherapies and estimation of the economic burden associated with unused medicines. *Int J Clin Pharm*. 2020;42(5):1311–1318.
- Smale EM, Egberts TCG, Heerdink ER, van den Bemt BJB, Bekker CL. Waste-minimising measures to achieve sustainable supply and use of medication. *Sustainable Chemistry and Pharmacy*. 2021;20:100400.
- Alshemari A, Breen L, Quinn G, Sivarajah U. Can we create a circular pharmaceutical supply chain (CPSC) to reduce medicines waste? *Pharmacy (Basel)*. 2020;8(4).
- Stam C. Disposal of medication costs millions Zorgvisie2012 [Available from: <https://www.zorgvisie.nl/weggooien-van-medicijnen-kost-miljoenen-zvs015094w/>].
- Hazell B, Robson R. *Pharmaceutical Waste Reduction in the NHS*. NHS Business Services Authority; 2015.
- Law AV, Sakharkar P, Zargazadeh A, et al. Taking stock of medication wastage: unused medications in US households. *Res Soc Adm Pharm*. 2015;11(4):571–578.
- GIVMED. The social solidarity clinic and pharmacy of GIVMED 2020 [cited 2020 11 June] <https://givmed.org/en/programma/koinofeils-foreis/>. Available from: .
- Thompson CA. Oklahoma allows limited medication recycling: program aims to help indigent patients. *Am J Health Syst Pharm*. 2005;62(14):1437–1438.
- Glanville M, Brady R, Miller S. Operation Donate: defining the value of redispensing medications donated by individuals. *J Am Pharm Assoc*. 2003;54(5):542–547, 2014.
- Cauchi R, Berg K, Hanson K, Robinson S. *State Prescription Drug Return, Reuse and Recycling Laws*; 2018 [Available from: <https://www.ncsl.org/research/health/state-prescription-drug-return-reuse-and-recycling.aspx>].
- McRae D, Allman M, James D. The redistribution of medicines: could it become a reality? *Int J Pharm Pract*. 2016;24(6):411–418.
- Bekker CL, Gardarsdottir H, Egberts ACG, Bouvy ML, van den Bemt BJ. Redispensing of medicines unused by patients: a qualitative study among stakeholders. *Int J Clin Pharm*. 2017;39(1):196–204.
- Alhamad H, Patel N, Donyai P. How do people conceptualise the reuse of medicines? An interview study. *Int J Pharm Pract*. 2018;26(3):232–241.
- Hui TKL, Donyai P, McCrindle R, Sherratt RS. Enabling medicine reuse using a digital time temperature humidity sensor in an internet of pharmaceutical things concept. *Sensors*. 2020;20(11).
- Hui TKL, Mohammed B, Donyai P, McCrindle R, Sherratt RS. Enhancing pharmaceutical packaging through a technology ecosystem to facilitate the reuse of medicines and reduce medicinal waste. *Pharmacy (Basel)*. 2020;8(2).
- Bekker CL, Gardarsdottir H, Egberts ACG, et al. What does it cost to redispense unused medications in the pharmacy? A micro-costing study. *BMC Health Serv Res*. 2019;19(1):243.
- Toh MR, Chew L. Turning waste medicines to cost savings: a pilot study on the feasibility of medication recycling as a solution to drug wastage. *Palliat Med*. 2017;31(1):35–41.
- Bekker CL, Kalicharan RW, Melis EJ, et al. Redispensing of unused HIV post-exposure prophylaxis for medical students. *Trav Med Infect Dis*. 2019;29:82–83.
- Chauhan M, Alhamad H, McCrindle R, Hui TKL, Sherratt RS, Donyai P. Medicines as common commodities or powerful potions? What makes medicines reusable in people's eyes. *Pharmacy (Basel)*. 2021;9(2).
- Donyai P, McCrindle R, Hui T, Sherratt R. Stakeholder views on the idea of medicines reuse in the UK. *Pharmacy*. 2021;9:85.
- Bekker CL, van den Bemt BJB, Egberts ACG, Bouvy ML, Gardarsdottir H. Willingness of patients to use unused medication returned to the pharmacy by another patient: a cross-sectional survey. *BMJ Open*. 2019;9(5), e024767.
- Alhamad H, Patel N, Donyai P. Beliefs and intentions towards reusing medicines in the future: a large-scale, cross-sectional study of patients in the UK. *Int J Pharm Pract*. 2018;26:12–13.
- McRae D, Gould A, Price-Davies R, Tagoe J, Evans A, James DH. Public attitudes towards medicinal waste and medicines reuse in a 'free prescription' healthcare system. *Pharmacy (Basel)*. 2021;9(2).
- Lam Y, McCrindle R, Hui TKL, Sherratt RS, Donyai P. The effect of quality indicators on beliefs about medicines reuse: an experimental study. *Pharmacy*. 2021;9(3):128.
- Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci*. 2011;6:42.
- Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349–357.
- Hehnehan MB, Hussain T, Barrera L, et al. Applying the COM-B model to patient-reported barriers to medication adherence in pediatric acute lymphoblastic leukemia. *Pediatr Blood Cancer*. 2020;67(5), e28216.
- Fahim C, Acai A, McConnell MM, Wright FC, Sonnadarar RR, Simunovic M. Use of the theoretical domains framework and behaviour change wheel to develop a novel

- intervention to improve the quality of multidisciplinary cancer conference decision-making. *BMC Health Serv Res.* 2020;20(1):578.
42. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Adm Policy Ment Health.* 2015;42(5):533–544.
 43. Kamberelis G, Dimitriadis G. Focus groups: contingent articulations of pedagogy, politics, and inquiry. In: Denzin NK, Lincoln Y, eds. *Collecting and Interpreting Qualitative Materials.* third ed. ed. Thousand Oaks, CA: Sage Publications Inc; 2008: 375–402.
 44. Saunders B, Sim J, Kingstone T, et al. Saturation in qualitative research: exploring its conceptualization and operationalization. *Qual Quantity.* 2018;52(4):1893–1907.
 45. Birt L, Scott S, Cavers D, Campbell C, Walter F. Member checking: a tool to enhance trustworthiness or merely a nod to validation? *Qual Health Res.* 2016;26(13): 1802–1811.
 46. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol.* 2006;3 (2):77–101.
 47. White K, Habib R, Hardisty DJ. How to shift consumer behaviors to be more sustainable: a literature review and guiding framework. *J Market.* 2019;83(3): 22–49.
 48. Mackridge AJ, Marriott JF. Returned medicines: waste or a wasted opportunity? *J Publ Health.* 2007;29(3):258–262.
 49. Beyene K, Aspden T, Sheridan J. Using the Behaviour Change Wheel to explore potential strategies for minimising harms from non-recreational prescription medicine sharing. *Res Soc Adm Pharm.* 2019;15(2):130–144.
 50. *Directive 2011/62/EU of the European Parliament and the Council of the European Union.* 2011.
 51. Connelly D. Should pharmacists be allowed to reuse medicines?. online *The Pharmaceutical Journal A Royal Pharmaceutical Society Publication.* 2018;301(7915): 20–23.
 52. NHS England and NHS Improvement. *Novel Coronavirus (COVID-19) Standard Operating Procedure: Running a Medicines Re-use Scheme in a Care Home or Hospice Setting.* Department of Health & Social Care; 2020. Contract No.: 001559.
 53. *Trial NL9208: The ROAD to Sustainable Medication Use: Redispersing Unused Oral Anticancer Drugs.* Dutch Trial Register; 2021 [Available from: <https://www.trialregister.nl/trial/9208>].