TRANSACTIONAL PROCESSING SYSTEMS

Why do Belgian Community Pharmacists Still Treat Electronic Prescriptions as Paper-Based?

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Abstract

Belgium is in a transition phase from paper-based prescriptions to electronic prescriptions (ePrescriptions) during which both the paper and electronic format are valid. Since patients still get a paper proof of the ePrescription, sometimes pharmacists use the ePrescription as paper-based prescription. When the government demands a complete dematerialization, i.e. no more paper-based prescriptions, this will no longer be possible. Therefore, we questioned the frequency and reasons for treating an ePrescription as paper-based. The logged interactions in the national database were used to identify possible reasons. The tarification service Koninklijk Limburgs Apothekers Verbond (KLAV) provided prescriptions of June 2018. KLAV supports tarification for community pharmacies all over Belgium, thereby providing a representative sample for the Belgian community pharmacies. A two-stage cluster random sampling technique was applied to retrieve a subset of 10,000 prescriptions. In this subset we identified 4961 ePrescriptions (49.61%) of which 226 (4.56%, in total 2.26%) were treated as paper-based. Reasons observed for this incorrect handling are (1) non-compliance of the community pharmacist; (2) errors in software or handling of the community pharmacist; (3) errors at the prescriber side or patient tries to fraud; (4) incorrectly revoking the ePrescription; and (5) errors in software of prescriber. The main reasons for treating ePrescriptions as paper-based are non-compliance of the community pharmacist ($n = 124$, 54.87%) by ignoring its digital nature, and errors in software or handling of the community pharmacist ($n = 85$, 37.61%). Future research is necessary to investigate user opinions and to measure the impact of introducing ePrescribing in the daily routine.

Keywords Electronic prescribing · Medical informatics · Community pharmacy services · eHealth · Belgium

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Introduction

Electronic prescribing, or "e-prescribing" is the computer-based electronic generation, transmission and filling of a prescription, taking the place of paper and faxed prescriptions. [1] Often the terms electronic prescribing, e-prescribing, ePrescribing and eRx are used interchangeable.

In order to better understand the electronic prescription functionalities, literature often refers to the 3Ps model. [2] The model mainly shows how the three Ps (prescriber, pharmacy and patient) are connected via the ePrescribing system. In Belgium, both the prescriber and pharmacist are connected to the national eHealth platform via their software package.

A doctor's visit may result in the prescribing of medication. The ePrescription is then saved on a central server, after which the patient is free to choose the pharmacy for dispensing the medicines. Kierkegaard [3] stated that the patient's freedom of choosing any pharmacy at any time for each prescription in Belgium might hamper the implementation of a successful ePrescribing system; at least compared to the situation in countries with one dedicated pharmacy or with non-competing pharmacies. [3] For example in Denmark [4], Finland [5] and Sweden [6], a centralized infrastructure is used where the patient is bound to one pharmacy. [7] However, the model where patients are free to choose at what pharmacy their medication was dispensed, does not always have to be a limitation. For example, in Estonia [8] and Czech Republic [9] this model applies, where a high usage of the ePrescription is present. EPrescription usage in these countries are respectively over 99% and 81%. [8, 9]

The Belgian eHealth platform provides users in the ePrescription workflow with a range of services, such as access control, codification and anonymization, timestamping, etc. These services are integrated in several Belgian projects that can be used by software vendors. Multiple projects in Belgium work together in order to serve the patient in a digital way. For example, the Recip-e project is responsible for the transport and temporary storage of ePrescriptions on a national server in an encrypted manner. [10] In a similar way, MyCareNet is the national project that is responsible for instant communication between health care providers and the health insurance funds, such that the insurability of the patient can be verified when necessary. [11]

Both projects (Recip-e and MyCareNet) are connected to the national eHealth platform and provide a software development kit (SDK) such that software vendors can easily implement their services. Since in Belgium a third-party payment mechanism applies, the patient only pays the share that is not reimbursed by his health care insurance. eHealth services are linked in such a way that community pharmacies get the ePrescription (via Recip-e) of the patient while instantly checking the patient's insurability (via MyCareNet), such that

at delivery the community pharmacist can just invoice the patient's out-of-pocket payment amount.

At the end of each month, the community pharmacist sends all prescriptions that need to be reimbursed to a tarification service, which then invoices the remaining costs towards the healthcare insurances of the patients. So the flow of the traditional 3Ps model in Belgium will traditionally be complemented with the inclusion of a tarification service.

Currently, Belgium is in a transition phase towards complete dematerialization. [12] In this transition phase (January 2017 – January 2020), both the typical paper-based prescription (handwritten or typed) and the ePrescription are valid to prescribe the medication to a patient. When an ePrescription is used, the patient receives a paper proof of prescription. This paper proof has a unique identifiable Recip-e ID (RID) barcode printed on top (Electronic Supplementary Material A, Fig. A1). [12] In the phase of complete dematerialization, prescribers will no longer provide the patient with a proof of prescription but instead only rely on eHealth services that fulfill the requirements to send prescriptions to a secure server. Pharmacists will then be able to retrieve the ePrescription of the patient by using the patient's electronic identity (eID).

During the transition period, the Recip-e project observed that not all Belgian ePrescriptions were dispensed electronically. This means community pharmacists still treat the proof of prescription of an ePrescription as a paper-based prescription. When this paper proof disappears (as originally planned in January 2020), community pharmacists will be obliged to only use the patient's eID to retrieve the ePrescription. Therefore, we investigated how frequent ePrescriptions were treated as paper-based in a Belgian context and the reasons why ePrescriptions are still treated as paper-based.

Methods

In Belgium, a question was raised by the Algemene Pharmaceutische Bond (APB), partner in the Recip-e project, to tarification services to set up a possible collaboration to find errors in ePrescribing. In the beginning of 2018, Koninklijk Limburgs Apothekers Verbond (KLAV) showed willingness for providing data coming from the community pharmacies that used their facilities. Ethical approval for this study was obtained from the ethical committee of UZ Brussels (nr. 2018/218, B.U.N. 143 201 836 461).

The tarification service KLAV provided prescriptions of June 2018. From this sample, we randomly selected 10,000 prescriptions coming from 50 community pharmacies registered to KLAV. In order to select a representative random sample we used a two-stage cluster random sampling technique. In a first stage of randomization we used

the province (location) where the community pharmacy in Belgium was located and in a second stage we used the number of prescriptions per community pharmacy on a monthly basis (amount).

These 10,000 prescriptions were then categorized per type (ePrescription, paper-based prescription, extended delivery[1]). All prescriptions are collected at the tarification service on a monthly basis. For this study, the tarification service provided information on whether the prescription arrived at their service as an ePrescription or not. Afterwards we manually screened the type of all paper proofs. If a digital version of the prescription was obtained at the tarification side, it was categorized as 'ePrescription' after manual validation. All other prescriptions were categorized manually by default. ePrescriptions are registered by the community pharmacist by scanning the RID barcode on top of the prescription and correctly dispensing the patient's medication by providing the correct actions in the community pharmacist's software.

For ePrescriptions, RID barcodes were registered and used to retrieve all logged interactions (including actor and time of interaction) of the prescription on the national server. In a normal flow (Fig. 1) the following interactions can be observed consecutively: (1) *createPrescription* by a prescriber to create and store the ePrescription on the national server; (2) *getPrescription* by the community pharmacist to retrieve the ePrescription; (3) *markAsDelivered* by the community pharmacist to indicate that the ePrescription was correctly dispensed; and (4) *markAsArchived* by the community pharmacist to send it to the archive such that the tarification service is able to process the prescription. Other possible interactions include *getPrescriptionByPrescriber* where a prescriber can verify what was found on the prescription, *revokePrescription* where the prescriber (and in some cases the community pharmacist) is able to cancel and remove the electronic proof, *markAsUndelivered* where a community pharmacist indicates that there was no delivery, e.g., when the products are not in stock and *markAsArchivedbis* an action allowed by the community pharmacist when he was not certain about a previous archiving procedure. This last *markAsArchivedbis* interaction is only allowed when preceded by a correct *markAsArchived* interaction. It was introduced initially for situations with two incorrect archiving attempts.

Based on the interactions with the ePrescription logged on the national server, we analyzed reasons why community pharmacists may have treated the ePrescription as paper-based prescription.

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[1] The type extended delivery contains a (or multiple) product(s) that were not in stock when the patient visited the community pharmacy. The patient then receives a paper specifying the necessary products for which the delivery was extended in that pharmacy. The community pharmacist is obliged to indicate a reference to the original prescription (ePrescription or paper-based prescription). The validity period of the original prescription remains.

Results

In Belgium there were 4943 community pharmacies registered in 2017 (source Sirius Insights [13]). In June 2018, 563 of these community pharmacies (11.39%) used the KLAV tarification services (Table 1). These pharmacies processed a total of 794,724 prescriptions in June 2018, for which no special tarification rules applied like it is the case in,e.g., prescriptions for patients living in resting homes. After a two-stage cluster random sample selection, 50 of these 563 community pharmacies using the KLAV tarification service (8.88%) were selected of which the first 200 prescriptions per selected pharmacy were then collected.

In total, the 50 selected community pharmacies handled 82,952 prescriptions (10.44%). The random sample of 200 prescriptions taken per pharmacy resulted in a total of 10,000 prescriptions.

Of this random sample of 10,000 prescriptions, 4961 were electronic prescriptions (49.61%), 4677 were paper-based prescriptions (46.77%) and 362 extended deliveries (3.62%) (Table 2). Of the ePrescriptions observed in this random sample, 226 prescriptions (4.56%, in total 2.26%) were treated by the community pharmacist as an ordinary paper-based prescription.

Every ePrescription is uniquely identifiable using the RID barcode on top of the proof of ePrescription. Using this RID barcode, the interactions that occurred with these ePrescriptions were retrieved. Five possible reasons for which these ePrescriptions were treated as paper-based were observed (Table 3).
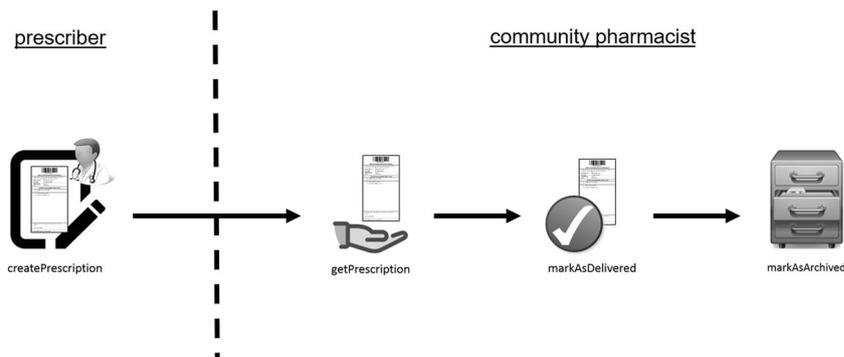
Non-compliance of the community pharmacist

We observed 124 ePrescriptions (54.87%) that underwent a single prescriber interaction (i.e., *createPrescription*) which means that no pharmacist tried to retrieve the content of the ePrescription (Fig. 2). In the end, the paper proof of the ePrescription was used as a paper-based prescription for retrieving the patient's products. In this setting, the community pharmacist did not comply with the normal flow. Non-compliance can be defined as ignoring the digital nature of the ePrescription and using the proof of ePrescription as paper-based prescription, for which no *getPrescription* interaction was found.

This type of error occurred in 24 of the 50 included community pharmacies (48.00%), with a median of two ePrescriptions per random selection of 200 prescriptions. Only two pharmacies presented this behavior more frequently, i.e. one community pharmacy showed this behavior in 60 out of 200 prescriptions (30.00%) and another one demonstrated this behavior in 10 out of 200 prescriptions (5.00%).

A low number of ePrescriptions treated as paper-based prescriptions per community pharmacy might indicate an

Fig. 1 Correct workflow of interactions with the Belgian ePrescription: (1) createPrescription; (2) getPrescription; (3) markAsDelivered and (4) markAsArchived

accidental erroneous handling, whereas a higher number might indicate that the community pharmacist avoided using the electronic procedure. Both actions do not comply with the workflow expected to be used when handling ePrescriptions.

Errors occur in software or handling of community pharmacists

85 prescriptions (37.61%) were observed in which three types of flows of interactions belonging to this type of problem occurred (Fig. 3). A first flow is when a *createPrescription* is followed by a (or multiple) *getPrescription* without additional interactions. Another flow is when an additional interaction *markAsUndelivered* is observed after the *getPrescription*. The third flow of interactions consisted of a *createPrescription*, followed by a *getPrescription* and a *markAsDelivered*. Hereafter, it is expected that a pharmacist correctly archives the ePrescription such that the tarification service can process it. However, this third flow shows an incorrect *markAsArchivedbis* without having an archiving interaction first.

If the paper proof of ePrescription ended up at the tarification service, it means that the medication was dispensed to the patient without retrieving the ePrescription digitally in a correct manner. This can either be caused by software implementation errors or by the community pharmacist

who carries out an undesired action in the software package to deliver or archive the ePrescription.

However, in 15 of these 85 cases (17.65%) the community pharmacist tried multiple times to retrieve the ePrescription, without success. In one case (1.18%) even the prescriber was consulted (i.e., *getPrescriptionByPrescriber*) by the pharmacist.

Error occurs at prescriber side or patient tries to fraud

We observed 12 proofs of ePrescriptions (5.31%) responsible for only three distinct ePrescriptions (Fig. 4). When paper-based prescriptions were still standard, prescribers sometimes copied the prescription instead of creating several prescriptions manually in order to save time, so that the patient did not need to return to the doctor's office too often for a new prescription. However, sometimes this way of working introduced fraud by the patient by copying the prescription. With the ePrescription, Belgium introduced a control mechanism for this, where each prescription has a unique RID barcode.

Possible explanations are that the software of the prescriber incorrectly copied the identifier RID code when requesting a duplicate of the prescription or the prescriber incorrectly decided to print the prescription multiple times. Another possibility is that the patient himself decided to make a copy of the proof of ePrescription, resulting in fraud.

Table 1 Representation of the random sample that was drawn from the tarification service KLAV in the period June 2018

Community pharmacies			Prescriptions		
Level	*N*	*%*	*Level*	*N*	*%*
National	4943	100.00			
KLAV (total)	563	11.39	KLAV (total)	794,724	100.00
			KLAV (subset)	82,952	10.44
Random sample	50	1.01	Random sample	10,000	1.26

Table 2 Observations within the random sample of prescriptions (*n* = 10,000)

Type of prescription	N	%
Electronic prescription	4735	47.35
Electronic prescription treated as paper-based prescription	226	2.26
Paper prescription	4677	46.77
Extended delivery	362	3.62

Table 3 Reasons for treating the ePrescription as a paper-based prescription (n = 226)

Reasons	N	%	% in random sample
Non-compliance of the community pharmacist	124	54.87	1.24
Error occurs in software or handling of community pharmacist	85	37.61	0.85
Error occurs at prescriber side or patient tries to fraud (double RIDs)	12	5.31	0.12
Incorrectly revoking the ePrescription	3	1.33	0.03
Error occurs in software of prescriber	2	0.88	0.02

Incorrectly revoking the ePrescription

In three cases of the 226 ePrescriptions that were handled as a paper-based prescription (1.33%) a prescriber first generated a prescription and then shortly after revoked the ePrescription (i.e., *revokePrescription*), possibly by executing a wrong command in the software (Fig. 5).

The revoke interaction was introduced to cancel an ePrescription digitally. Explanations for this error are the incorrect software handling of the prescriber or a graphical user interface that is not user-friendly to the prescriber. In the single case where the pharmacist tried to contact the prescriber, the prescriber also retrieved the prescription digitally (i.e., *getPrescriptionByPrescriber*) but then incorrectly revoked it.

Error occurs in software of prescriber

The last type of error observed in this sample is linked to the software of the prescriber. We observed an ePrescription without a RID barcode but stating the wording "proof of ePrescription" on it (Fig. 6). The ePrescription was generated by a medical software with an ePrescribing module, but due to an implementation error the software was not able to print the uniquely identifiable RID barcode. Since the RID barcode is used to retrieve the electronic prescription, the community pharmacist was not able to retrieve the ePrescription.
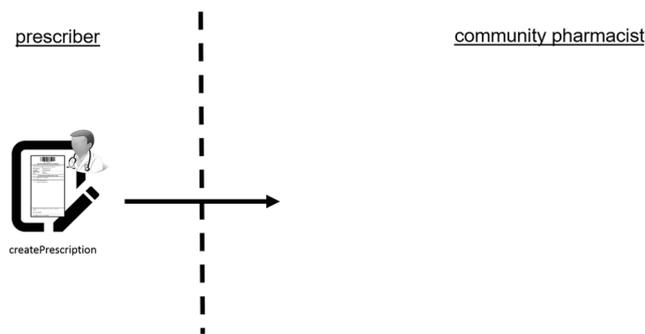

Fig. 2 Workflow of non-compliance of the community pharmacist (no additional interactions were found at the side of the community pharmacist)

Discussion

In this observational study we analyzed 10,000 prescriptions of which 4961 were ePrescriptions. A total of 226 ePrescriptions (4.56%, in total 2.26%) were erroneously treated as paper-based by the community pharmacist. Through analysis of the interactions that happened with the ePrescriptions, we were able to distinguish five possible reasons why community pharmacists treat them as paper-based: (1) non-compliance of the community pharmacist; (2) errors occur in software or handling of the community pharmacist; (3) errors occur at the prescriber side or the patient tries to fraud; (4) incorrectly revoking the ePrescription; and (5) errors occur in software of the prescriber. The main reasons for treating an ePrescription paper-based were non-compliance of the community pharmacist (n = 124, 54.87%) whereby the electronic nature of the ePrescription was ignored and errors that occur at the community pharmacist's side (either by the software or the handling of the pharmacist himself inside the software) (n = 85, 37.61%).

To the best of our knowledge this is a first attempt to evaluate how frequent and why ePrescriptions are still handled as a paper-based prescription in a transition phase towards a full dematerialization. This methodology has the advantage that by manually consulting the prescriptions at a tarification service, we could easily gain insight in the frequency of ePrescriptions that were handled in an incorrect manner. Moreover, by looking at the interactions that occurred on the national Recip-e database we were able to retrieve reasons why these erroneous handlings occurred.

In this study, problems with connectivity of the national eHealth platform or problems with connectivity for checking the insurability of the patient by consulting MyCareNet were not considered as possible reasons for not treating the ePrescription in its digital form. However, this is the most prominent reported problem by community pharmacists on closed fora in Belgium [14] and was also reported in a work of Suykerbuyck et al. [12]. In case of connectivity problems, the national eHealth platform provided an eHealth Business Continuity Plan (BCP). In this BCP, health care providers using the eHealth service may fall back on paper-based

Fig. 3 Workflow with errors in software or handling of community pharmacists (software gets in loop or executes an incorrect interaction in the software)
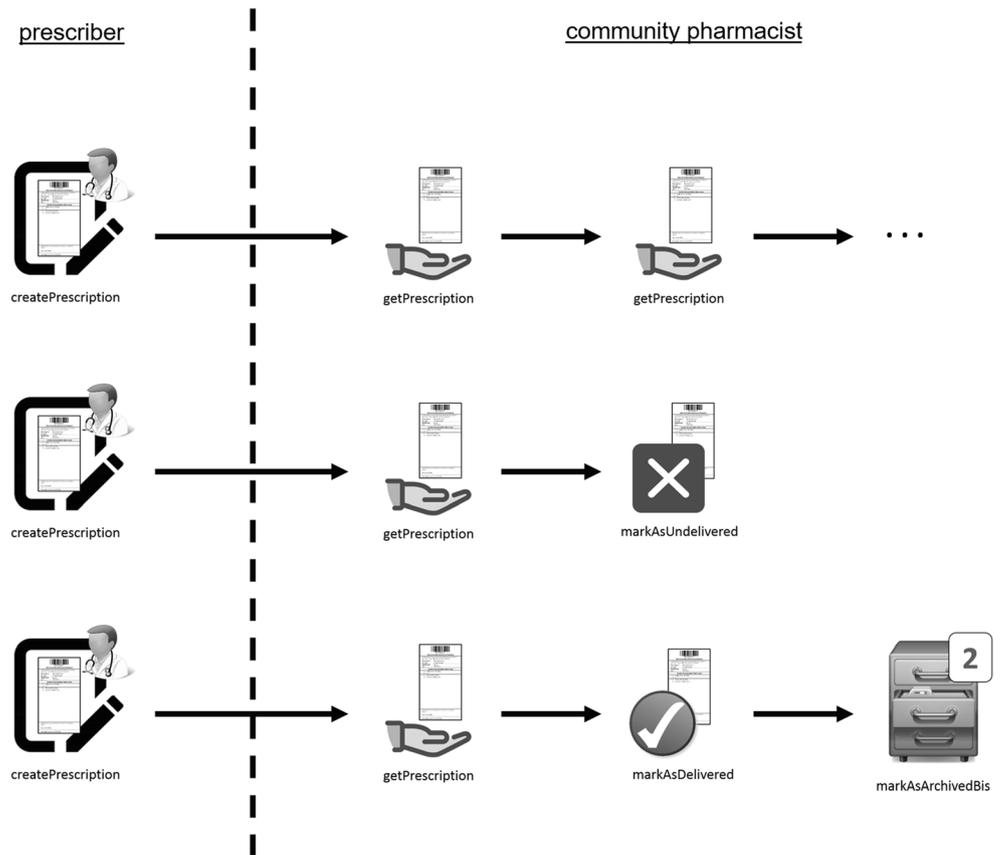
delivery in the context of ePrescribing. In the inclusion period of the study (June 2018), it was reported that the insurability module of MyCareNet gave connection problems only on one day (i.e. 12 June, 2018, [15]). That day, no interaction problems were logged at the community pharmacist's side. We thus assume connection problems had no influence on the paper-based treatment of ePrescriptions during the observed period. However, we expect (some) underreporting of connectivity issues by national eHealth instances given by the perception of the field. [14]

Fig. 4 Workflow where errors occur at the prescriber side or patient tries to fraud (one unique RID represented on multiple ePrescriptions)
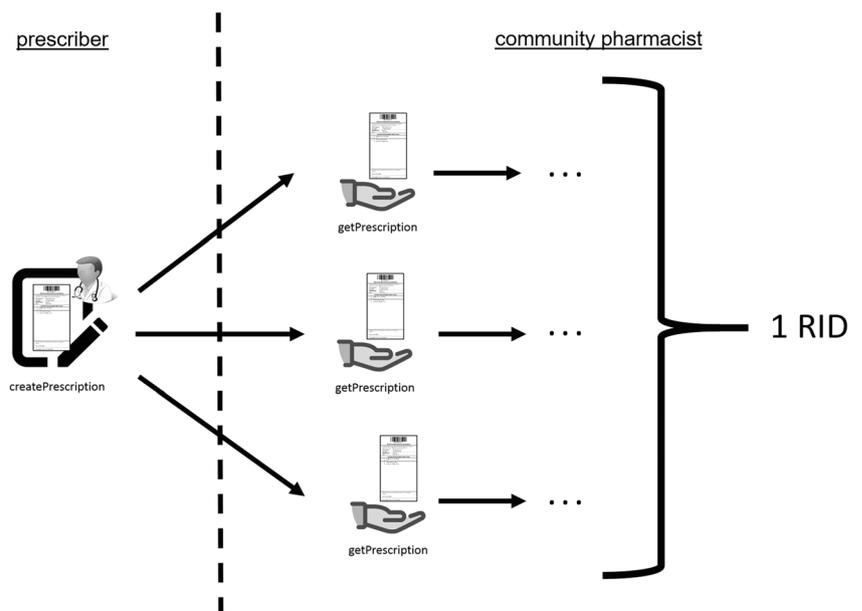
Fig. 5 Workflow where errors occur at the prescriber side or patient tries to fraud (revoked ePrescription gets at the community pharmacist)
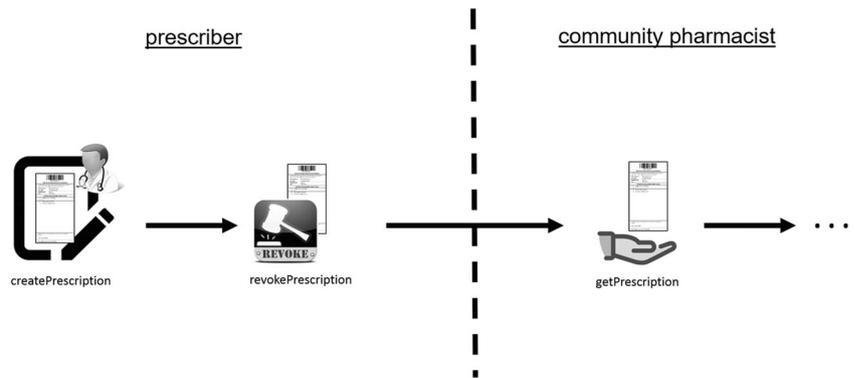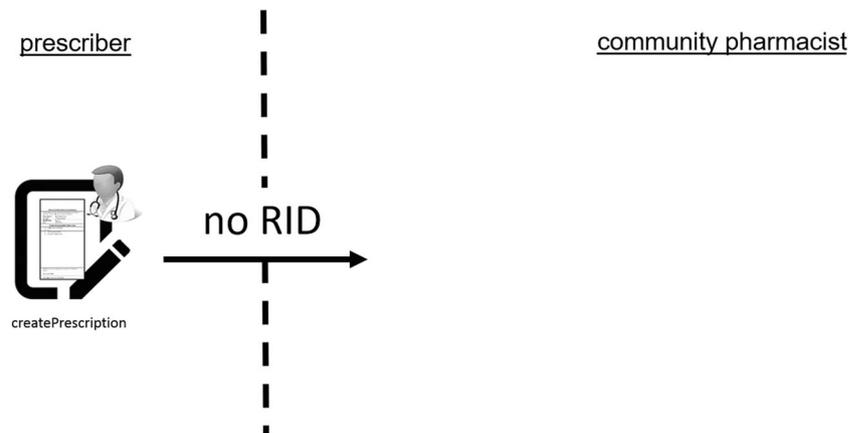

Fig. 6 Workflow where errors occur in the software of the prescriber (ePrescription without RID barcode)

When we want the community pharmacists to comply with the prescribing standards, one may think to give incentives for good actions and give penalizations for incorrect actions, once possible technical and practical fallacies -that stimulate this type of handling- are excluded in the workflow. Likewise, a prescribing incentive program began to use penalties in the form of Medicare payment adjustments for healthcare professionals who did not use ePrescribing systems in practice in the US. [2] However, some studies report that even with the presence of these incentives and penalties, several pharmacists are still reluctant to adopt the ePrescribing services. [16, 17] Nowadays, also in Belgium, a certain fatigue towards national eHealth systems is present due to the connectivity problems and poor communication about it.

A limitation of the study is that only one tarification service was included, which may raise questions about the generalizability of the outcomes for Belgium. However, since the tarification service KLAV delivers services to community pharmacies in all provinces located in Belgium, this two-stage cluster randomized sample is considered to be representative for the whole of Belgium.

Future research should focus on actively involving the pharmacists in confirming or finding additional reasons for using an ePrescription as a paper-based prescription in the community pharmacy in a transition phase. Also an investigation on impact for the doctors, pharmacies and patients routine in processing the paper-based prescription versus the ePrescription would be worth investigating, since delaying factors in the ePrescription workflow might introduce a certain reluctance with the users to use the digital nature of the ePrescription. The impact of treating the ePrescription as a paper-based prescription on social security is nihil, since all prescriptions pass the validation process at tarification. However, the impact on processing them at tarification in an electronic way (as was supposed) could be substantial by including a semi-automatic validation tool.

Compliance with ethical standards

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