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Availability and procurement conditions of originator and generic medicines in hospitals – an exploratory study in five medium-sized European countries

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Aim: To explore whether medicines used in hospitals in European countries are supplied as originators or generic medicines, and to investigate the procurement conditions, including the extent of discounts at which the medicines are provided.

Methodology: In September 2009, we collected primary data for four commonly used medicines in 25 public hospitals in five medium-sized European countries (Austria, The Netherlands, Norway, Portugal and Slovakia; between 2 and 11 hospitals per country). We surveyed whether the medicines were available in the hospitals and how they had been procured.

Results: With the exception of one medicine in one hospital, all selected medicines were available in the surveyed countries in at least in one presentation, i.e. in a specific pharmaceutical form, dosage or pack size. Simvastatin and amlodipine were preferably supplied as generic versions to the hospitals, whereas atorvastatin and clopidogrel (patent not expired in most surveyed countries) tended to be supplied as originator. With the exception of Slovakia, hospitals in the same country usually had the same procurement conditions, and tended to be granted the same extent of discounts and rebates. Some hospitals in Slovakia applied a limited tendering process for some medicines whereas others negotiated individually and were sometimes able to be granted discounts. Austrian hospitals received all three surveyed cardiovascular medicines for free. In comparison with other countries, medicines were more often supplied as originator than as generics to Austrian hospitals. Norway centrally procured defined presentations, usually generic versions, and obtained comparably high discounts.

Conclusion: Overall, the selected medicines were available, but hospitals tended to procure one or a few presentations of each medicine. In general, if generic alternatives were available, they were likely to be supplied to the hospitals but this was not always the case.

Keywords: Cardiovascular medicines, discounts, generics, procurement, rebates, tendering

Introduction

In recent years, policymakers in European countries have increased strategies to improve the uptake of generic medicines. For instance, INN prescribing (i.e. prescribing medicines by active ingredient rather than brand name), generics substitution (i.e. the practice of substituting a brand name medicine with a generic equivalent), and/or a reference price system (i.e. identical or similar medicines are clustered to a reference group, and the public payer defines the maximum amount – reference price – which is used as the basis for reimbursement for all medicines in the group), have been implemented in most countries of the European Union (EU) [1-8]. These policies to enhance the prescribing of generics versus on-patent medicines have, to a lesser or greater degree, been supplemented by further measures, typically in the outpatient sector, such as prescription monitoring and budgets, information campaigns to the public and, somewhat less frequently, financial incentives for pharmacists and patients [9-14].

This is done to ensure the provision of high-quality medicines at a lower financial burden for the payer, which is either the patient or the third party payer (social health insurance institutions or National Health Service). In many European countries, the latter covers, at least partially, the cost of medicines [7]. Generics are procured at, in some cases, considerably lower prices than originator medicines and thus contribute to savings for the payers, as seen in several countries, e.g. Sweden and Scotland [12, 15-20].

Pharmaceutical policy measures have usually focused on the outpatient sector. Pharmaceutical expenditure in hospitals has been fairly constant over the years (usually 5–10% of a nation's medicines budget), so it has not been a priority of policymakers in European countries [21]. Knowledge of pharmaceutical policies, including procurement and funding strategies, in the hospital sector in Europe has therefore been limited. While clinical issues have been covered by a large body of literature, policy-related research has been scant [22]. However, in recent years, this has been changing because of an increasing awareness of the need to learn about hospital-related pharmaceutical policies [23] and to improve the management of pharmacotherapy at the interface of the inpatient and outpatient sectors. Several countries have launched initiatives in this field [24].

This information gap is partly related to dual organization and funding of the pharmaceutical systems in the European countries. Medicines prescribed and supplied in outpatient care are funded by the third-party payer, usually the state, while the remainder has to be co-paid by the patient. The third party payer decides, based on pharmacological, therapeutic and health economic considerations, which medicines used in outpatient care are reimbursed [7]. In the inpatient sector, except for special funding models for high-cost medicines, medicines are financed out of hospital budgets, which are funded by the hospital owners, which might be the state, regions, municipalities,

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religious orders, or some pooled funding from taxes and social health insurance contributions, depending on the country's organization of healthcare services [25].

The outpatient and inpatient pharmaceutical systems tend to be seen as two distinct sectors within a country, hence the increasing focus on improving the interface management of pharmacotherapy. However, it is increasingly recognized that medication started during the hospital stay can impact the future medicines prescribed after a patient has been discharged [26-33]. It has been suggested that it might be better to supply, at favourable conditions, hospitals with off-patent medicines in order to ensure the initial prescribing with these medicines. However, as far as the authors know, no study has ever looked at the availability of originators and generic medicines at the level of individual hospitals in European countries. This is increasingly essential as more standard treatments lose their patents [34, 35].

Against this backdrop, this study sets out to explore whether medicines used in hospitals in European countries are supplied as on-patent or generic medicines. Furthermore, we aim to investigate the procurement conditions, including the extent of discounts at which the medicines are provided.

Methodology

The analysis for this manuscript draws from data collected during the European Commission co-funded PHIS (Pharmaceutical Health Information System) project, which aimed to survey medicine management in hospitals in European countries and to collect prices of medicines used in hospitals (particularly on-patent medicines) [36, 37]. The methodology of this study was influenced by overall methodological decisions taken earlier in that project. For instance, the data collection was done for a larger basket of medicines, predominantly on-patent oncology medicines without generic alternatives.

Selection of medicines

Out of a basket of medicines whose data we had surveyed, we selected those four molecules for which a 'generic' version was on the market. These were:

- amlodipine
- simvastatin
- atorvastatin
- clopidogrel.

Table 1 provides the list of these four active ingredients indicating the ATC (Anatomical Therapeutic Chemical) code and the key therapeutic indication.

We included cardiovascular medicines because they account for high volumes in the outpatient sector, and the initial treatment in hospitals typically impacts further outpatient use [38].

Table 1: List of active ingredients selected for the survey

Active Ingredient	ATC code	Key therapeutic area
Amlodipine	C08CA01	cardiology
Simvastatin	C10AA01	cardiology
Atorvastatin	C10AA05	cardiology
Clopidogrel	B01AC04	blood

ATC: anatomical therapeutic chemical classification of the World Health Organization (WHO).

At the time of the survey, the patent for clopidogrel had expired in some European countries, and not in others. In order to expand the study by another medicine not for cardiovascular treatment, we also included this blood product.

Selection of countries

We defined the following selection criteria for the countries, to ensure: 1) a geographic balance; 2) a balance between 'old' and 'new' EU Member States (acceded to the EU before and after May 2004) as well as European Economic Area (EEA)/European Free Trade Association (EFTA) countries; 3) a balance between countries with a social health insurance system and those with a general taxation-based system (national health service); 4) a balance between countries with a decentralized and a centralized procurement policy for medicines used in hospitals; and 5) a balance of countries of different economic situations. This is in line with cross-country comparisons available in the current literature [39].

Countries selected were Austria, The Netherlands, Norway, Portugal and Slovakia. We could not reach a balance in all cases, but we had countries from different geographic parts of Europe (criterion 1), at least one new EU Member State (Slovakia) and an EEA/EFTA country (Norway) (criterion 2), countries in different economic situations (criterion 5), and we had a balance regarding countries with a social health insurance system (Austria, The Netherlands, Slovakia) and those with a national health service (Portugal, Norway) (criterion 3). Centralized tendering for medicines in hospitals as a key procurement policy was organized in one country (Norway), and in two further countries it was done as a first step (Portugal) or for specific medicines (high-cost medicines; Slovakia) (criterion 4).

The selected countries had a variety of policies to enhance the prescribing and use of on-patent medicines versus generics. Table 2 provides an overview of country characteristics including their generic drug policies.

During the selection of the countries, country representatives (typically from pharmaceutical pricing and reimbursement authorities and national hospital pharmacy associations) involved in the PHIS (Pharmaceutical Health Information System) project as collaboration partners were addressed, and their support for the survey was sought. Thus, the willingness of the country representatives in our network was effectively an additional practical criterion for selection, and partially explains the selection of the countries, e.g. we did not manage to include a large country.

Survey instrument

A questionnaire was developed by the management team of the PHIS project, i.e. the authors and colleagues at their institutions. The draft methodology papers, including the questionnaire, were circulated with the PHIS Advisory Board (European Commission, Executive Agency for Health and Consumers, Eurostat, OECD, WHO Europe and WHO Headquarters) and the PHIS network members and then revised following their feedback. The methodology was piloted in two hospitals in Portugal and in one hospital in Austria, and adjustments to the questionnaire were based on the lessons learned from the pilot.

Table 2: Countries of the survey and their specifications

Countries	Austria [10, 40-44]	Netherlands [1, 6, 9, 19, 23, 45-48]	Norway [1, 19, 49-54]	Portugal [1, 2, 12, 41, 55-61]	Slovakia [57, 62-67]
General information about hospitals					
Number of hospitals	266 (2008)	206	87 (2008)	189 (2008)	122
Type of hospitals	38% of hospitals are general hospitals	Around half of all hospitals are general hospitals	All hospitals are general hospitals	77% of public hospitals are general hospitals	80 general hospitals
Ownership	60% of hospitals are public	All hospitals function in the public section (non-profit)	≈ 90% of the hospitals are public	92 hospitals (73%) are public hospitals	87 hospitals are public
Size of hospitals	–	–	Approx. 50% are small, 30% of medium-sized, and 20% are large	2.9 beds per 1,000 inhabitants (North) 3.4 (Centre) 4.1 (Lisbon) 2.4 (South)	9 large hospitals, 18 middle-sized hospitals, 20 small hospitals, 21 university hospitals (= total of public hospitals)
Pharmaceutical expenditure in % of total hospital expenditure	Approx. 9%	4.3% (2006)	3.8% (in public hospitals)	–	11%
Supply chain and procurement in hospitals					
Number of hospital pharmacies	17% of all hospitals have a hospital pharmacy. The other hospitals are equipped with a so-called 'pharmaceutical depot'	Nearly all public hospitals have a hospital pharmacy	32 (in public hospitals)	All public hospitals	Apart from a few very small hospitals, all public hospitals have a hospital pharmacy
Role of hospital pharmacy	Inpatient service, five out of all 46 hospital pharmacies also serve as a community pharmacy	Inpatient service, plus approx. 55% of all hospitals serve outpatients	Inpatient service, plus all hospitals have an outpatient department	Inpatient service, outpatient service under exceptional circumstances defined by law	Only inpatient service
Key suppliers	Mainly industry; wholesale and pharmacies are possible	Mainly industry; wholesale and pharmacies are possible	Wholesalers and pharmacies	Mainly industry; wholesale and pharmacies are possible	Wholesalers
Key procurement policies	Negotiations at hospital level	Procurement by regional purchasing groups, additional purchasing policy at hospital level	Central tendering by LIS for all public hospitals. Medicines not centrally procured by LIS are directly purchased by the hospitals at the maximum official price	Centralized tendering by an NHS agency in a first step, negotiations by hospitals in a second step	In case of annual expenditure between Euros 15,000 and Euros 30,000, 'market surveillance', i.e. bids from three wholesalers, otherwise negotiations of the hospitals

(Continued)

Table 2: Countries of the survey and their specifications (Continued)

Countries	Austria [10, 40-44]	Netherlands [1, 6, 9, 19, 23, 45-48]	Norway [1, 19, 49-54]	Portugal [1, 2, 12, 41, 55-61]	Slovakia [57, 62-67]
Generic drug policies (outpatient sector)					
Generic pricing policies	Generic price link	No generic price link, 'preferential pricing policy' (= tendering in the outpatient sector)	Generic price link ('Trinnprismodellen'/stepped price policy)	Generic price link	No generic price link
RPS	No	Yes, broad cluster	Yes, at ATC 5	Yes, at ATC 5	Yes, cluster of ATC 5 and 4
Generics substitution	Not permitted	Yes, indicative	Yes, indicative	Yes, indicative	Yes, indicative
INN prescribing	Not permitted	Yes, indicative	Yes, indicative	Yes, obligatory	Yes, obligatory
Prescribing monitoring	Yes, by regional sickness funds	Yes	Yes	Not systematically at the time of the survey	Yes
Financial incentives	No	Used to be for pharmacists in case of G dispensing, no longer at the time of the pharmacy	No	Temporary (6/2009-5/2010) exemption from co-payment for low-income pensioners for generics	No
Information campaigns to the public	Yes, by regional sickness funds	Yes	Yes	Yes, several campaigns	Yes
Further measures	Information to prescribers	Electronic tool to support INN prescribing, 'pharmacotheapeutic discussion groups' of GPs and pharmacists	Information to prescribers and pharmacists	Facilitating changes from copy products into generics status (to be included in the RPS)	Information to prescribers and pharmacists
Specific policies regarding molecules of the study and their impact					
Simvastatin	Multiple policies led to G sim at over 95% of total sim. by end of 2007, fall in prices of G sim	Multiple policies led to G sim at 97/98% from 2007 to 2010	Policies led to O sim of 7% of sim DDD basis, G sim prices at 85% of pre-patent loss prices	Demand-side policies led to G sim at over 90% of total sim (2007)	–
Atorvastatin	Multiple policies led to stabilization of G ator at 11/12% of total statins (2007)	Multiple policies led to a fall in the consumption of ator to 39% of total of statins (2010)	Prescribing restrictions and encouraging therapeutic switching led to reduction in ator consumption (26% of total statins, 2006)	Consumption of on-patent ator increased following G sim rising from 15% (before G sim market entry) to 25% by end of 2011	–
<p>Approx.: approximately; ATC: anatomical therapeutic chemical; ator: atorvastatin; G: generic; DDD: defined daily dose; GP: general practitioner; INN: International Nonproprietary Name, LIS: Legemiddelinnkjøpssamarbeid/Drug Procurement Cooperation; RPS: reference price system; sim: simvastatin. Data refer to the year of the survey (2009), unless indicated otherwise.</p>					

ORIGINAL RESEARCH

The questionnaire consisted of two parts: 1) a price survey form; and 2) a general questionnaire. The price survey form listed the selected molecules and asked for information about their availability, prices and procurement conditions in the hospitals. Information about the general availability in the country (marketing authorization) and price data for the outpatient sector (ex-factory prices for Austria, Portugal, Slovakia and pharmacy purchasing prices for The Netherlands and Norway) as of 30 September 2009 were already pre-filled with data provided by the Pharma Price Information (PPI) service of *Gesundheit Österreich GmbH* (Austrian Health Institute) [68]. Hospital pharmacists in the participating hospitals were asked to provide data as of 30 September 2009 on the availability, actual (real) prices at which medicines were supplied and procurement conditions, e.g. tendering processes versus direct negotiations, discounts, cost-free medicines, from the internal hospital databases. The general questionnaire contained questions about the medicines management in the surveyed hospitals.

Selection of the hospitals and data collection

The national network representatives were the ones identifying and approaching hospitals to explore their willingness to participate in the survey.

In Austria, The Netherlands, Norway and Portugal, we surveyed the data during study visits to the hospitals. Teams of at least two people, usually a researcher and a country's representative involved in the PHIS network (from a competent authority for pharmaceutical pricing and reimbursement and/or a hospital pharmacy association), met with the hospital pharmacists and collected on site the information about the availability and procurement conditions (part 1 and 2 of the survey instrument). Only hospitals that had agreed in advance to participate in the survey were visited. Since none of the hospital pharmacists withdrew their cooperation during the study visit, the response rate was 100% in these countries.

In Slovakia, we had a mixed approach. We made study visits to three hospitals. In addition, we presented the project to hospital pharmacists during the general assembly of their national association and asked for their support by responding in writing to the price survey form and the questionnaire. Eight hospitals in Slovakia returned the filled price survey form and the questionnaire. This explains the considerably higher participation rate of hospitals in Slovakia compared with other countries.

We performed the study visits in the five countries and received the written questionnaires from

Slovak hospitals between September 2009 and March 2010. On average, the study visits took about three hours per hospital¹.

The survey results include data from five hospitals in Austria, three hospitals in The Netherlands, four hospitals in Portugal, two hospitals in Norway and eleven hospitals in Slovakia. We focused on general hospitals and on hospitals in public ownership. Most of the hospitals willing to participate were large hospitals, i.e. more than 500 acute care beds; or medium-sized hospitals, i.e. between 400 and 500 acute care beds. Table 3 provides an overview of the hospitals in the survey in relation to the total in the selected countries.

Data analysis

Data for all presentations (a presentation is defined as a medicine in a specific pharmaceutical form, dosage and pack size) of the four selected molecules supplied to the hospitals were collected. For the purpose of the analysis, we defined a 'common presentation', for which we performed the comparison of availability and procurement conditions. Findings about further presentations are also presented, see Table 4.

Terminology

This paper uses the terminology as defined in the glossary on pharmaceutical terms developed by the WHO Collaborating Centre for Pharmaceutical Pricing and Reimbursement Policies [69]. Availability is defined as follows: The product is (physically) reachable for the patient, e.g. through the most accessible/appropriate healthcare supplier(s) at all times in adequate amounts and in the appropriate dosage forms, with assured quality and adequate information – so that patients have access to the medicine'. A discount is defined as 'a price reduction granted to specified purchasers under specific conditions prior to purchase', whereas a rebate is 'a payment made to the purchaser after the transaction has occurred'. Country-specific terms for discounts and rebates, e.g. 'rappel' in Portugal, and procurement, e.g. 'market surveillance' in Slovakia, will be explained in the results section (see Table 4).

Table 3: Hospitals of the survey, and their specifications

Country	Number		Description with regard to		
	n	%	Type	Ownership	Size
AT	5	1.9%	5 – general hospitals	5 – public hospitals	4 – large hospitals 1 – medium-sized hospital
NL	3	1.5%	3 – general hospitals	3 – public hospitals	2 – medium-sized hospitals 1 – small hospital
NO	2	2.3%	2 – general hospitals	2 – public hospitals	1 – large hospital 1 – medium-sized hospital
PT	4	2.1%	4 – general hospitals	4 – public hospitals	4 – large hospitals
SK	11	9.0%	10 – general hospitals 1 – specialized hospital	11 – public hospitals	8 – large hospitals 3 – small hospitals

AT: Austria; NL: The Netherlands; NO: Norway; PT: Portugal; SK: Slovakia; n: number of hospitals of the sample in that country; %: percentage of hospitals of the sample as share of the total number of hospitals in that country. Large hospitals = > 500 acute care beds, medium-sized hospitals = 400–500 acute care beds, small hospitals = < 400 acute care beds; a different definition for Slovakia (according to its country-specific classification): large hospitals = > 400 acute care beds, medium-sized hospitals = 200–400 acute care beds, small hospitals = < 200 acute care beds.

¹This investigation was part of a large study during which we also surveyed further information. This contributed to the rather long average study visit duration.

Table 4: Availability and procurement conditions of five molecules, originator and generic versions, in 25 hospitals in five medium-sized European countries

Medicines		Austria (n = 5)	Netherlands (n = 3)	Norway (n = 2)	Portugal (n = 4)	Slovakia (n = 11)
amlodipine (common format 5 mg 28/30 tabs)						
amlodipine O	A	4/5: Y, 1/5: N	0/3: Y, 3/3: N	2/2: Y, 0/2: N	1/4: Y, 3/4: N	4/11: Y, 7/11: N
	P	4/5: individually purchased, cost-free provision	–	2/2: individually purchased (Ø discount: 14%)	1/4: following central tender individually purchased by hospital, no discount/rebate	4/11: individually purchased by hospital, no discount
amlodipine G	A	1/5: Y, 4/5: N	3/3: Y, in different pack size (50 tabs), 0/3: N	2/2: Y, 0/2: N	3/4: Y, 1/4: N	11/11: Y, thereof: 5 mg tabs (30 tabs) in 10/11 and 10 mg (30 tabs) in 7/11
	P	4/5: individually purchased, cost-free provision	3/3 (50 tabs): individually purchased, 26–43% discount	2/2: centrally tendered, 82% discount	3/4: following central tender individually purchased by hospitals, ‘rappe’ rebate	3/11 (5 mg) and 6/11 (10 mg): market surveillance 3/11 (5 mg): 0–17% discounts 6/11 (10 mg): cost-free provision in 2 hospitals, 0% discounts in 4 hospitals
simvastatin (common format 20 mg 28/30 tabs)						
simvastatin O	A	0/5: Y, 5/5: N	0/3: Y, 3/3: N	0/2: Y, 2/2: N	0/4: Y, 4/4: N	0/11: Y, 11/11: N
	P	–	–	–	–	–
simvastatin G	A	5/5: Y, 0/5: N	3/3: Y, 0/3: N	2/2: Y, 0/2: N	3/4: Y, 1/4: N, thereof in one case on two different formats (60 20 mg tabs and 10 mg tabs)	8/11: Y, 3/11: N
	P	5/5: individually purchased, cost-free provision	5/5: individually purchased, 53–66% discount	2/2 (28 tabs): centrally tendered, 86% discount; in case of individual purchase by hospital: 0%; 2/2 (90 tabs): centrally tendered, 91% discount; in case of individual purchase: 0% discount	3/4: following central tender individually purchased by hospital, ‘rappe’ rebate (corresponding to product-specific discount of 25% according to estimate of one hospital)	3/11: market surveillance, 0.1–0.2% discounts 5/11: individually purchased, 0.1–8.1%
atorvastatin (common format 20 mg 28/30 tabs)						
atorvastatin O	A	5/5: Y, 0/5: N	3/3: Y, 0/3: N	2/2: Y, 0/2: N	4/4: Y, 0/4: N	4/11: Y, 7/11: N
	P	5/5: individually purchased, cost-free provision	3/3: individually purchased, ≈ 90% discount for 3/3	2/2 (28 tabs): centrally tendered, ≈ 80% discount	4/4 (different pack sizes: 28, 56, 100) following central tender individually purchased by hospitals, ‘rappe’ rebate – discounts from 0% to nearly 100%	4/11 (not the common format but different ones: 100 10 mg, 30 40 mg, 30 80 mg): individually purchased, 0% discount for 4/4
atorvastatin G	A	0/5: Y, 5/5: N	0/3: Y, 3/3: N	2/2: Y, 0/2: N	0/4: Y, 4/4: N	10/11: Y, 1/11: N

(Continued)

Table 4: Availability and procurement conditions of five molecules, originator and generic versions, in 25 hospitals in five medium-sized European countries (Continued)

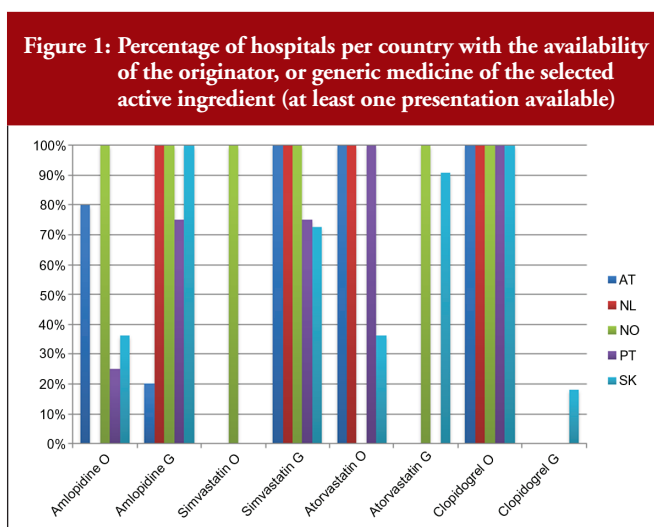
Medicines		Austria (n = 5)	Netherlands (n = 3)	Norway (n = 2)	Portugal (n = 4)	Slovakia (n = 11)
	P	–	–	in case of individual purchase by hospital: 0% discount	–	2/11: market surveillance, 0% discounts 8/11: individually purchased, 0% discount for 5/11, ≈ 5% discount for 2/11 (with cost-free provision in case of another format with larger pack size), cost-free provision for 1/11
clopidogrel (common format 75 mg 28/30 tabs)						
clopidogrel O	A	5/5: Y, 0/5: N	3/3: Y, 0/3: N	2/2: Y, 0/2: N	4/4: Y, 0/4: N	11/11: Y, 0/11: N
	P	5/5: individually purchased, 0% discounts	3/3: individually purchased, 3–18% discount	2/2 (28 and 84 tabs): centrally tendered, 7% discount; in case of individual purchase, e.g. the parallel imported product, by hospital: 0% discount	4/4: following central tender individually purchased by hospitals, 'rapel' rebate in 2/4 – discounts of 0–12% expected	10/11: market surveillance, 0% discount 1/11: individual negotiation, ≈ 3% discount
clopidogrel G	A	0/5: Y, 5/5: N	0/3: Y, 3/3: N	0/2: Y, 2/2: N	0/4: Y, 4/4: N	2/11: Y, 9/11: N
	P	–	–	–	–	1/1: market surveillance, 0% discount 1/1: individual negotiation, ≈ 5% discount
A: availability; P: procurement conditions; tabs: tablets; 'common format': format in the focus of the analysis.						

Results

Figure 1 provides an overview of the availability of the selected medicines as originator or generic versions in the hospitals of the survey. Table 4 presents further information related to the procurement conditions, including the extent and types of discounts provided. Different procurement conditions surveyed were: cost-free provision, central tendering, market surveillance and individual purchase by the single hospital.

Variations were found between the countries and molecules: Hospitals in Norway, Slovakia and also Portugal and The Netherlands had the generics version more frequently available than did hospitals in Austria. Generic clopidogrel was only available in Slovakia, where the patent had already expired. Except for Norway, originator atorvastatin tended to be supplied to hospitals more frequently than the generic version, whereas simvastatin had the highest generic availability among the surveyed cardiovascular medicines across all countries. Except for Austria, amlodipine was preferably supplied as generic versions.

With the exception of one medicine in one hospital in Portugal, all surveyed hospitals had at least one presentation of the selected medicines. Hospitals in Austria, The Netherlands and Portugal always had exactly one presentation of the active ingredients, either originator or generic versions. In a few cases hospitals in Norway and Slovakia had both originator and the



generic versions of the same presentation of a cardiovascular medicine. There was one hospital in Slovakia, which already had the generic version of clopidogrel, in addition to the originator.

Norway is the only country in which the surveyed medicines were exclusively centrally tendered, and the tendered presentations, independently whether they were originators or generics, were granted comparably high discounts. In Portugal, medicines

used in hospitals were centrally tendered in a first step, during which an official tendering price to be valid for some years was set, and in a second step hospitals individually purchased the medicines they needed and could sometimes negotiate lower prices. In the other countries, hospitals individually procured the medicines from their suppliers, typically manufacturers and in very few cases wholesalers. For specific medicines, some hospitals in Slovakia used an instrument called 'market surveillance'; i.e. a limited tendering process in which bids from three suppliers were requested and evaluated.

Discounts of 100% were observed in Austria (in the case of all three cardiovascular medicines in all hospitals) and in Slovakia (in very few cases) regardless of whether the originator or a generic version was supplied. A discount of 100% means that the medicines were provided to the hospital 'cost-free'. Discounts in Portugal were difficult to assess at product level since they were granted in the form of a so-called 'rappel' during the purchase process of the hospital. Rappels are ex-post rebates, usually implemented at the end of the calendar year, with a bundling element, since they were granted to hospitals for a specific sales volume of all medicines of a supplier during a year.

Discussion

The study looked at the availability of a small sample of medicines in hospitals in medium-sized European countries, to learn whether these medicines were available and in which form. We found that, with one exception, all surveyed medicines were available in all 25 surveyed hospitals. One hospital in Portugal did not have simvastatin; we were informed that the hospital had decided against procuring it since other medicines (atorvastatin) were considered sufficient as therapeutic choice.

The findings of our study, though exploratory due to the limited number of medicines and hospitals surveyed, highlight differences in availability between the outpatient and the hospital sectors. The selected medicines were marketed and were provided in community pharmacy in several different formats (different dosages and pack sizes) in the five countries (information provided by the PPI service [68]), but the hospitals usually had very few formats of a medicine, in most cases often exactly one format. This confirms that dispensing practices in hospitals are different than those in community pharmacies. In hospitals, single-dose packing is applied, whereas in the outpatient sector the full pack is dispensed to the patient who should then take the medication according to the instructions. In hospitals, therefore, medicines of a pack (large packs are purchased) are generally used for several patients.

Given the focused availability in hospitals, pharmaceutical companies are incentivized to be the sole supplier of a molecule to the hospitals. Even if the sales volume per product might be limited in the single hospitals, supplies for inpatients can be considered as strategically important for those medicines which will be used for long-term treatment in outpatient care after the patient's discharge from hospital. Particularly if there are no or limited policies to enhance generics use in the outpatient sector (such as mandatory generics substitution, INN prescribing, information campaigns to the public, see Table 2 for an overview of these policies in the five countries), a change to the generic

drug might be unlikely once treatment was started with an on-patent product. Reluctance by general practitioners to switch from the originator to a generic drug was even reported in Germany [70], a country with active generic drug promotion policy resulting in overall high generics uptake [71, 72]. Cardiovascular medicines, whose availability in hospitals we surveyed, are a typical example [27, 28, 38].

The stakeholders involved have conflicting objectives. Suppliers have a commercial interest to gain market shares, ideally to ensure sales volumes in the long run, whereas payers aim to keep costs down. Since several European countries have different public payers and/or different funding sources for the pharmaceutical bill in the outpatient and inpatient sectors [21, 22, 25, 63], the outpatient and inpatient payers are incentivized to shift treatments, patients, and costs from one sector to another. This is likely to impact the health outcomes of patients negatively, since such situations can irritate patients, and lead to medication errors [73-77].

Given these organizational and financial frameworks, the findings of our study are not surprising. Hospital pharmacists are under financial pressure to procure best prices within the existing pharmaceutical budgets, and they will thus purchase from those suppliers who offer the highest discounts. The purchasers' approach is illustrated by the data that we collected on Austria. Austria is one of a few European countries in which cost-free provision of medicines to hospitals is allowed [22, 25, 40]. This procurement strategy is commonly used, at least for some medicines. In general, hospitals in Austria were not able to obtain discounts for new on-patent medicines, or to receive them as cost-free medicines [22, 25, 63, 78], but the five hospitals of the survey received the three cardiovascular medicines cost-free, two of which were originator brand-name medicines. We do not know whether generics manufacturers were in the position to offer as high discounts as the originator industry. Suppliers of originator medicines may benefit from longer-lasting business relationships with the hospitals and can adapt the marketing strategy in advance of patent expiry. Furthermore, suppliers that offer a range of medicines for different indications may be able to offer specific delivery conditions, including some kind of bundling. The cost-free provision of originator cardiovascular medicines in hospitals may considerably impact the continued use of originator medicines in outpatient care, particularly since Austria does not have INN prescribing, generics substitution or a reference price system [1]. Given the limited demand-side measures to enhance generics uptake, see Table 2, sickness funds (social health insurance institutions) as public payers for outpatient medication are required to constantly undertake information activities and prescribing monitoring. Due to dual financing, the key target groups are prescribers in the outpatient sector, and only recently sickness fund launched information activities addressing prescribers and staff in hospitals, however as a voluntary initiative, since social health insurance is not responsible for funding medicines in hospitals [10].

Stakeholders react in response to the incentives provided by the system. Interviews in Austria confirmed that hospital pharmacists were aware of the dilemma of supporting the start of a treatment with an originator medicine, but since they are

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responsible to their hospital administration, they will act in the best interest of the hospital.

The purchasing power of a single hospital might be questioned. Even if some hospitals might be able to obtain higher discounts, e.g. hospitals in Slovakia, overall the findings displayed rather small differences in discounts between the hospitals, and they suggested limited headroom of the individual hospitals to negotiate large price reductions. Central tendering is likely to be connected with stronger purchasing power. Norway has decided that medicines for all public hospitals are centrally procured by the public procurement agency LIS (*Legemiddelinnkjøpssamarbeid*, Drug Procurement Cooperation). LIS defines preferred presentations and tenders for them. Medicines not tendered by LIS, e.g. different pack sizes, dosages, can be purchased individually by the hospitals [49]. The data from our survey showed that LIS tended to define a generic as a preferred version of the surveyed cardiovascular medicines. It was reported that hospitals in Norway had individually purchased some other 'non-preferred' presentations of these molecules, and they were not granted any discounts. The example of Norway could be considered as good practice since it combines financial elements with awareness-raising activities targeting prescribers. LIS staff have performed extensive information activities in hospitals to inform doctors about the defined presentations, and the rationale behind for selecting them. At the same time, the practice highlights the relevance of financial incentives that, in the case of Norway, support measures to enhance generics use in hospitals. In a country such as Austria, on the other hand, generics promotion activities of hospital pharmacists (via the Drugs and Therapeutics Committee, for instance, and their generics substitution which has been performed in hospitals for years but is not permitted in the outpatient sector) [40] are less effective since a limited number of generics are available due to cost-free provision of the originators to hospitals.

We also included clopidogrel in the basket of surveyed medicines even if the patent had only expired in Slovakia at the time of the survey. We learned in the interviews that hospital pharmacists in the other countries were eagerly awaiting the patent expiry because they aimed to change to the generics version as soon as possible, and obtain larger discounts and even cost-free provision in the case of Austria. However, hospital pharmacists might not see their expectations fulfilled given the controversy regarding generic clopidogrel, which was launched as a different salt with fewer indications initially [79, 80].

Our study has several limitations. A major limitation concerns the small basket of medicines, with only three cardiovascular medicines plus clopidogrel, which is still patented in most of the countries studied. In addition, the number of hospitals varied among the countries and was low in some countries. We were not always able to obtain complete information on the procurement conditions, particularly on the discounts, since in Portugal the 'rappel', an ex-post bundling rebate, allowed at best estimates on the product-specific price reductions. Some limitations were related to the medicine procurement system in a country, such as the Portuguese 'rappel'. Also, this study was a follow-up of a larger study within the PHIS project, in which we surveyed more medicines, particularly on-patent medicines without any

generic alternatives. The overall setting of the EU funded PHIS project has, to a large extent, contributed to some methodological decisions. Competent authorities and hospital pharmacists, who were already members of the PHIS network, were involved as cooperation partners in the survey, and not academics. Finally, we acknowledge that the study focused on the aspect of procurement of medicines to hospitals and, though we discussed the implications of the supply of originators and generics versions for the overall healthcare system, in the light of existing generic drug policies in the outpatient sector, the issue of improving use of generics was not within the scope of this study.

Therefore, this study can only be considered as an exploratory piece of research. We recommend repeating the survey, applying the same survey design, but with a larger basket of medicines (including medicines with generics available due to recently expired patents) and including more hospitals and countries.

Notwithstanding its limitations, the study provides important new evidence. Medicines procurement policies and management in European hospitals have been overlooked by researchers and policymakers for a long time, and the investigation of pharmaceutical policies in the inpatient sector has been called for [23]. To our knowledge, the availability of originator and generic medicines in European hospitals has never been surveyed. In the EU and other high-income countries, including the US and Australia, studies on the availability of medicines have been limited to the outpatient sector, and availability not measured at the level of the single healthcare provider (pharmacy, retailer) but at the national level [81, 82]. Primary data collected on availability and prices of medicines in single healthcare units and dispensaries (e.g. hospitals, clinics, pharmacies, and retailers) have been performed based on the WHO/HAI methodology [83] in some low- and middle-income countries [84, 85] but not in high-income countries. We were able to survey additional data about the procurement conditions; particularly discounts and rebates considered as confidential information.

Conclusion

The study confirms the general availability of the selected medicines, and, at the same time, highlights the strategy of hospitals to be focused on one or a few presentations of a molecule. If generic alternatives are available, generics tend to be supplied to the hospitals but this is not always the case. Cardiovascular medicines, which were studied in this survey, are of relevance for both industry and public payers, since they account for high volumes due to high patient numbers and long-term use. The initial treatment in hospitals is likely to impact further medicine use in the outpatient sector and to result in a continuation of the same brand, especially if pharmaceutical policies do not encourage a switch to a generic version. The study provides a good starting point to learn about originator and generic medicines use in hospitals. The findings suggest the need to develop policies that support a more integrative healthcare system, e.g. via joint funding models for the outpatient and inpatient sectors, in order to improve medicine management at the interface of outpatient and inpatient sectors.

For patients

For patients it is important to obtain the medical treatment they require. Availability of and access to medicines is one major

element. The selected medicines were found to be available in the surveyed hospitals.

Generics provide an opportunity for a more rational use of medicines and for savings to public payers. Starting treatment with generics in the hospitals would be appreciated: public payers would achieve savings, and patients would continue in outpatient care with the medication they started. The study showed that in case of the generics alternatives available these are used in some but not all hospitals. In addition, the study suggests the need for improved pharmaceutical policies at the interface of the outpatient and inpatient sectors. Limited interface management directly impacts patients in a negative way, and can contribute to confusion, irritation and even deteriorated health outcomes of the patient.

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As a follow-up of the PHIS project, we analysed the data of medicines with a generic version available with regard to their availability and procurement conditions, and we prepared this manuscript. No separate funding was provided for the supplementary analysis regarding the research question and the drafting of this manuscript.

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