Greek National E-Prescribing System: Preliminary Results of a Tool for Rationalizing Pharmaceutical Use and Cost

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Abstract

Background: In Greece, due to the ongoing economic crisis a number of measures aiming at rationalising expenditure implemented. A new e-prescribing system, under a unified healthcare fund was the main pillar of these reforms focus on monitoring and auditing prescribing patterns.

Objective: Main objective of this study was to document the Greek experience with the new national e-prescribing system.

Methods: We analyse the dispensed prescriptions over the period 2013-2014, stratified into four levels: therapeutic subgroup, patent status, physician's specialty and geographical region.

Results: Data analysis offered a comprehensive insight into pharmaceutical expenditure over the timeframe and revealed discrepancies regarding composition of spending, brand-generic substitution within certain therapeutic subgroups, physicians' prescribing behaviour based on medical specialty, therapeutic subgroup as well as regional per capita measures.

Conclusions: E-prescribing system is a valuable tool providing sound information to health policymakers in order to monitor and rationalize pharmaceutical expenditure, in value and volume terms.

Keywords: E-prescribing system, generics, pharmaceutical expenditure

1. Introduction

In light of the current financial crisis in Greece, a number of specific cost-containment measures were implemented to regulate the pharmaceutical market and to rationalise pharmaceutical expenditure. Most constituted best practices across Europe (Kanavos et al., 2011) and resulted in a significant reduction in pharmaceutical expenditure (from €5.1 billion in 2009 to €2.0 billion in 2014, -61%) (SFEE, 2014). Specifically, a set of consistent policies on the supply-side comprising changes in the regulation of pharmaceutical prices, prescribing and fixing reimbursement levels, and on the demand-side, including interventions affecting prescribers, companies and patients, was implemented to enhance the use of less expensive medicines, and to control prescription and consumption (Economou, 2011). In addition, the recently implemented national e-prescription system was an innovative tool to provide real-time and comprehensive prescribing data (Pangalos et al., 2013). It also aimed to reduce spending on drugs for which generic substitutes were available and for drugs prescribed inappropriately (Frouzi et al., 2013). However, currently, in Greece doctors have not been provided with incentives for prescribing generics (Lambrelli & O'Donnell, 2011), which are priced at 40% of the originator prior to losing patent protection. At the same time, incidents, such as prescribing without a definite diagnosis or doing so inappropriately, still occur (Tsiantou et al., 2013). In Greece, outpatient services are provided by public or private practitioners. Private practitioners might be contracted with the National Organization for Healthcare Provision

(EOPYY) and general practitioners (GPs) have no gatekeeper or referral role, which is partly due to the low number of GPs. Notably, Greece had the highest number of doctors per capita (with 6.3 doctors per 1,000 people); however, medical specialists greatly outnumbered general practitioners (OECD, 2015), which can indicate a minor role of GPs.

In this context, this paper will focus on real-time physicians' prescribing patterns based on specialty, geographical region and mix (brand versus generics) of pharmaceutical products. In addition, the main objective of this study is to document the Greek experience with the new national e-prescribing system.

2. Methods

We obtained e-prescribing data collected from a central database for all 2013 and 2014 prescriptions. The data contained information on the monthly number of prescriptions (approximately 6,000,000) for different types of reimbursements from all physicians (almost 41,000) in all geographical regions in Greece. Prescriptions were generated through the international non-proprietary name based and mandatory e-prescribing system and were transmitted electronically to private pharmacies. Coverage was universal, and all prescription-only drugs were reimbursed by social insurance, whereas over-the-counter and "lifestyle" drugs were not reimbursed (Karakolias & Polyzos, 2014; Yfantopoulos, 2008). Because the above process between a physician's office and EOPYY owned pharmacies was not supported by the e-system until now, drugs provided to patients directly from EOPYY owned pharmacies were not included in the analysis. Consumption was measured in unit volumes (packages) and in total monetary value (included beneficiary's co-payment). It should be noted that EOPYY divided the pharmaceutical market into patent, off-patent brand name and generics drugs. The analysis was based on four elements: therapeutic class according to the Anatomical Therapeutic Chemical (ATC) classification system, physician's specialty, patent status and geographical region.

3. Results

Total drug consumption and expenditure between 2013 and 2014 are shown in Table 1. E-prescriptions executed at EOPYY's pharmacies represented an additional expenditure of approximately 640 million euros in 2014 (similarly to 2013), which represented about 27% of the total market. Based on the results, alongside the decrease in the number of prescriptions (13.6 million prescriptions or a 6.8% decrease), there was also a decrease in the amount pharmaceuticals consumed (328.54 million euros or a 11.8% decrease), which implied not only that the physicians' prescription habits changed, but also that there was a reduction in drug prices. Another reason behind this discrepancy was perhaps that the number of prescriptions for high-priced drugs dropped by more than the number of prescriptions for low-priced drugs. According to the total pharmaceutical expenditure and quantity, the average pharmaceutical price in 2014 was 12.89 euros per box compared to 13.62 euros in 2013; thus, a reduction of 5.38% occurred. It should be noted that EOPYY's beneficiary's co-payments increased by 8.1% (50 million euros) from 2013 to 2014. As a result, social insurance spending on pharmaceuticals soundly declined in 2014 (379 million euros, or a 18.0% decrease).

Table 1. Total outpatient drug consumption by EOPYY's Beneficiaries (2013-2014)

Drug Consumption	2013	2014	Change (%)
Prescription units (in millions)	199.01	185.41	-6.8
EOPYY's expenditure	2,100.09	1,721.25	-18.0
Co-payment (in million euros)	617.80	668.10	8.1
Total expenditure (in million euros)	2,717.89	2,389.35	-11.8

Note. Total expenditure = EOPYY's expenditure + co-payment

Then, we found large differences between ATC groups (we focused on ten major ATC-2 groups consisting of 86% of the total outpatient drug expenditure) in terms of spending, as shown in Table 2. The ATC-2 groups that contributed the most to the spending were drugs that affected the nervous system and cardiovascular systems. Specifically, antihypertensives, nervous system drugs and lipid modifying agents accounted for approximately 45% of the total expenditure. Also, there was a reduction in those ATC groups' expenditure (12.4%, 15.0% and 14.6%, respectively, compared to the average reduction of 12.1%).

Table 2. Total outpatient drug spending per ATC-2 Group (2013-2014)

ATC-2	Description	Expenditure (million €)		Expenditure (% of total)		Change (%)
		2013	2014	2013	2014	
C04-09	Antihypertensives	442.54	387.85	16.3	16.2	-12.4
N01-07	Nervous System drugs	453.02	384.93	16.7	16.1	-15.0
C10	Lipid modifying agents	328.18	279.18	12.1	11.7	-14.9
A10	Antidiabetic agents	247.17	238.40	9.1	10.0	-3.6
B01-06	Blood Substitutes	202.23	186.57	7.4	7.8	-7.7
R01-07	Respiratory drugs	198.09	175.31	7.3	7.3	-11.5
A01-09	Digestive Tract agents	169.26	144.42	6.2	6.0	-14.7
J06-07	Vaccines and Serums	100.36	97.28	3.7	4.1	-3.1
M01-09	Musculoskeletal drugs	115.55	94.87	4.3	4.0	-17.9
J01-05	Antibiotics, Antivirals etc.	93.16	80.55	3.4	3.4	-13.5
Other		368.32	319.99	13.6	13.4	-13.1
Total		2,717.89	2,389.35	100.0	100.0	-12.1

When assessing how often physicians prescribed generic medicine instead of an originator brand in their current practice, we found that approximately half of the total expenditure (on average, 48%), in terms of volume, fell under "off patent drugs" in both 2013 and 2014, while the generic market share increased, on average, by 1% in 2014. The share of generic and off-patented medicines is presented in Figure 1. These results might explain the variations observed. Specifically, the proportion of brand-generic substitution for hypolipidemic (C10) and digestive tract drugs (A01-09) exceeded 50%. The share of generics for the other drug category (i.e., antidiabetic drugs, A10) was, on average, 15%, which implied that there would be room for improvement in 2015. Conversely, the vaccines and serums (J06-07) were dominantly brand names, whereas the generic respiratory drugs (R01-07) gained a greater market share than the branded ones. The analysis suggested that generic penetration into all other therapeutic categories did not grow.

Figure 1. Share of e-prescriptions: Branded products vs. generic products, per ATC-group (2013-2014)

We compared e-prescription values by specialty and found that 53% of total outpatient pharmaceutical expenditure was prescribed by Internists and General Practitioners (GPs) (Figure 2).
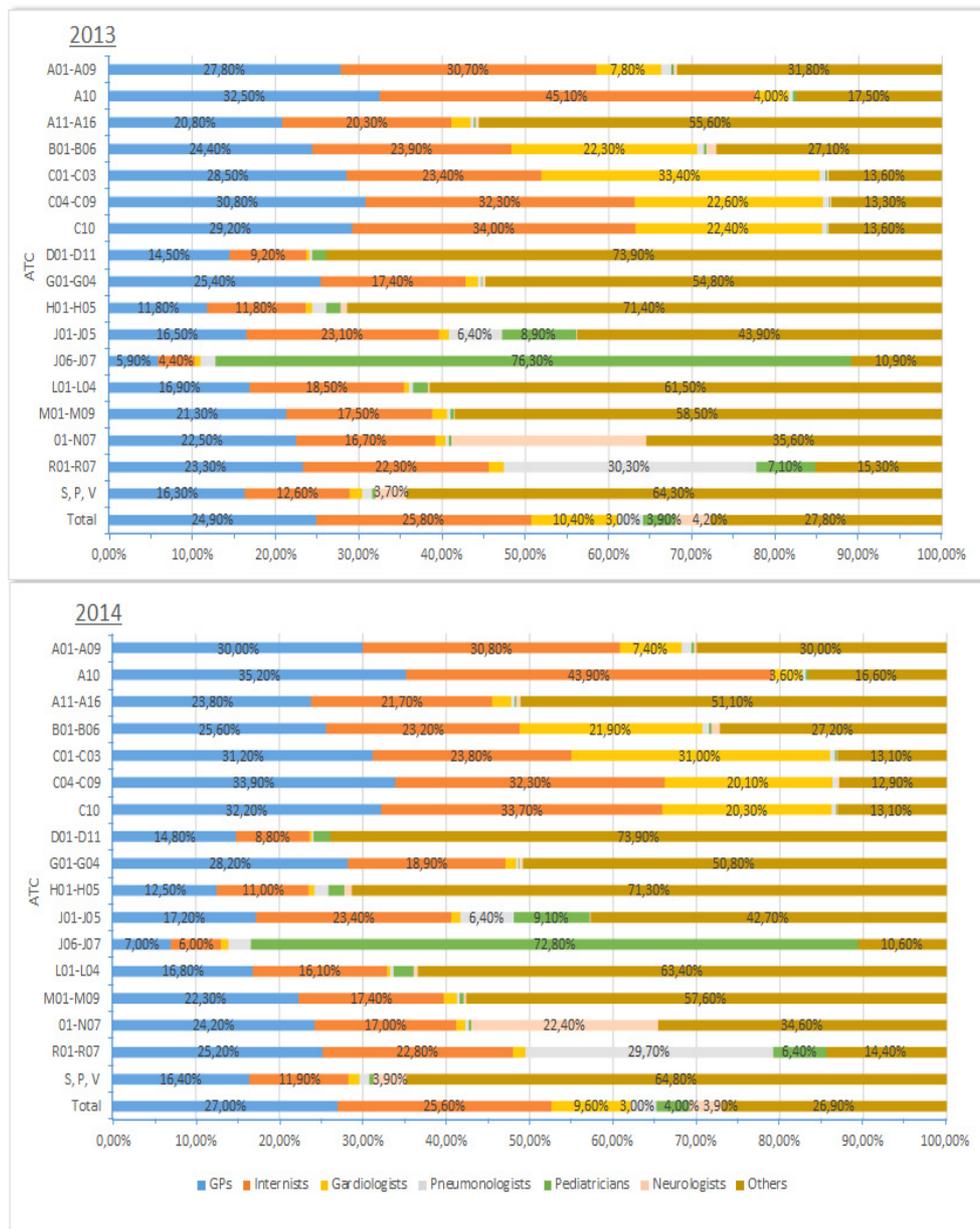
Figure 2. Outpatient drug consumption per ATC-2 group with respect to medical specialty (2013-2014)

An analysis of consumption aggregated by ATC subgroup was performed by geographical region and was stratified by medical specialties. At the level of medical specialty, prescription data suggested that GPs prescribed the vast majority of antidiabetic drugs (A10) and β-blockers (C04-09), while, at the same time, the contribution by Internists to the prescription of antidiabetic (A10) and hypolipidemic drugs (C10) was more significant compared to that of other ATC subgroups. Similar portions incurred in 2014; however, GP contributions increased among all other ATC subgroups (from 25% in 2013 to 27% in 2014). In summary, the distribution of drug consumption by medical specialty did not differ notably during the timeframe (Figure 2).

Data on pharmaceutical expenditure for each of the geographical regions are presented in Table 3. Specifically, in 2014, expenditure reductions were observed both in terms of volume (6.6%, on average) and, more so, value (almost 12%) compared to 2013 (Figure 3).

Table 3. Pharmaceutical spending distribution per capita by geographical region (2013-2014)

Administrative Districts	Average Volume per capita (in packages)			Average Expenditure per capita (in €)		
	2013	2014	Change (%)	2013	2014	Change (%)
East Macedonia & Thrace	20.6	19.5	-5.3	273.3	242.0	-11.5
Central Macedonia	18.8	17.6	-6.4	254.0	224.6	-11.6
Western Macedonia	18.4	17.5	-4.9	248.3	223.2	-10.1
Epirus	20.9	20.0	-4.3	285.5	259.6	-9.1
Thessaly	19.9	18.9	-5.0	268.8	240.7	-10.5
Ionian Islands	21.4	20.2	-5.6	288.5	257.8	-10.6
Central Greece	19.4	18.5	-4.6	263.9	237.1	-10.2
Attica	16.2	14.8	-8.6	228.9	197.0	-13.9
Peloponnesus	19.4	18.4	-5.2	267.1	237.8	-11.0
Aegean Islands	18.7	17.5	-6.4	240.9	214.1	-11.1
Crete	18.3	17.3	-5.5	259.3	231.9	-10.6
Total	18.2	17.0	-6.6	250.4	220.7	-11.9

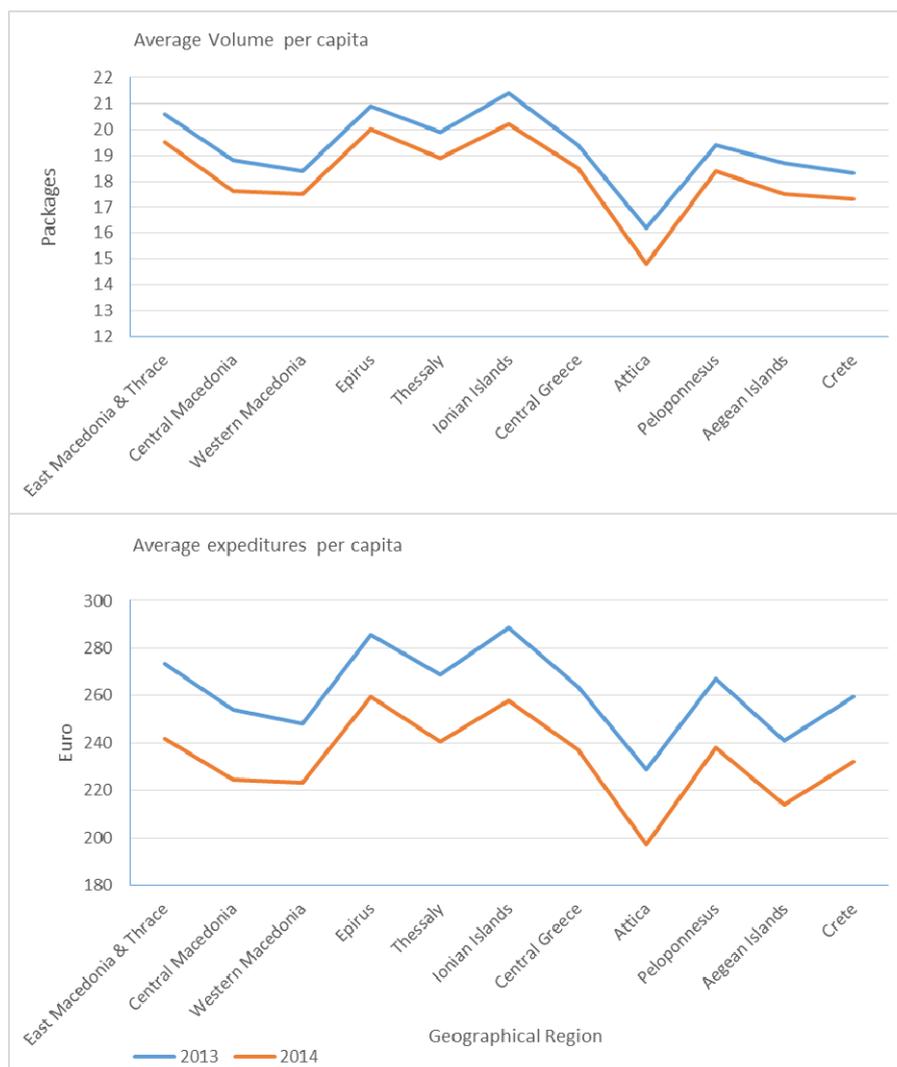

Figure 3. Pharmaceutical spending distribution per capita by geographical region (2013-2014)

4. Discussion

In Greece, as a result of the recent financial crisis, a number of health reforms and controlling public pharmaceutical spending efforts were implemented. Regarding the latter, drug spending mainly focused on: a) the pricing of medicines, b) monitoring prescribing, and (c) increasing the use of generic drugs (Kontodimopoulos, 2013).

This study aimed at examining real-time physicians' prescribing patterns based on the Greek national e-prescribing system and to our knowledge it's the first survey conducted in Greece, which undertakes the aforementioned topic. The first results showed a decrease in pharmaceutical expenditure in both value and volume. Although, this reduction was partly explained by price cuts (in 2013, 13.62 euros versus 12.89 euros in 2014, a 5.38% reduction, on average, per drug package), it was also explained by other measures adopted by the Ministry of Health such as prescription patterns, use of generics and updating the "positive list" of reimbursed medicines using the reference price system. As a way to address volume, a 1 euro co-payment fee per prescription was implemented to tackle overprescribing.

Furthermore, our results indicated that the penetration of generics remained considerably low in value terms (20%), whereas the proportion of brand-generic substitutions exceeded 50% in terms of volume. We have to clarify that generic substitution is allowed by pharmacists in Greece.

On the other hand, the present study revealed that generics of different therapeutic subgroups penetrated the domestic market unequally. Although, pharmaceutical policies aimed at promoting cost containment should further encourage use of generics, as shown by previous researchers (Kontodimopoulos et al., 2013), these policies should be focused on specific therapeutic subgroups in which generic use falls far from international standards. A previous study (Polic-Vizintin et al., 2014) showed that the share of generic psychopharmaceuticals (N03-N06) was, on average, 44.3%; however, in Greece, the relevant proportion (ATC subgroup N01-07) was just 16% and 19% in 2013 and 2014, respectively (Gilman & Kautter, 2008).

The differences among medical specialties regarding prescription behaviour over time were also notable. For example, GPs have diminished their prescribing value much less than the total average (4.7% versus 12.1%). On the contrary, the average prescription value of doctors of other medical specialties (e.g. cardiologists and orthopaedics) receded significantly (19.3% and 19.8%, respectively versus 12.1%). Furthermore, this finding suggested that specific incentives, as well as prescribing pattern control, should be provided within certain medical specialties.

At the geographical region level, we detected regional divergences regarding per capita figures. Notably, the most populated urban regions (Attica: Athens; C. Macedonia: Thessaloniki), despite the over-concentration of health care providers (Karakolias & Polyzos, 2014), appeared to be less costly in terms of both per capita value and volume. Particularly, the average per capita drug consumption reached 18.2 packages per resident in 2013 compared to 17.0 packages per resident in 2014, whereas the same figures in Attica were 16.2 and 14.8 packages per resident, respectively, compared to 21.4 and 20.2 packages per resident, respectively, in Ionian islands. Correspondingly, per capita drug expenditure in Attica accounted for 228.9 and 197.0 euros per resident in 2013 and 2014, respectively, thus being much lower than the average expenditure (250.4 and 220.7 euros per resident, respectively) in rural areas. This finding may be partly explained by data, which suggested that inefficiencies existed in the healthcare services delivery in rural areas of Greece as well as the large proportion of elderly in rural areas (Jelastopoulou et al., 2014). Moreover, the average per capita volume declined by 6.6% from 2013-2014, while the average decline in per capita expenditure was almost double (11.9%). Based on the results, alongside the increase in the EOPYY's beneficiary's co-payments, these was also an increase in the average co-payment rate from 23% in 2013 to 28% in 2014, which implied not only that the average out-of-pocket pharmaceutical expenditure changed, but also that there is an increase financial burden, especially, on low-income family.

In summary, the new e-prescription information system in Greece provides sufficient (in terms of volume and value) data to monitor and evaluate pharmaceutical consumption. However, there are still deficiencies concerning data elaboration and dosage information via defined daily dose, which may be used as a measure of consumption and as a prescribing indicator for the quantification of medicine usage (Walley & Mossialos, 2004). Prescribing is the most common therapeutic approach offered to patients (an average of 0.6 prescription items per individual in 2014); thus, the e-prescribing system will change several of the incentives facing the physicians and the patients, as it is safer, faster and more transparent (Walley & Mossialos, 2004). In addition, it is a powerful auditing tool allowing comparisons over time between individuals and regional or national physicians' prescribing patterns (Polyzos et al., 2014, Theodorou et al., 2009, Labiris et al., 2015). Furthermore, to address overprescribing Ministry of Health can introduce financial incentives for physicians to encourage rational

prescribing, such as budgets, as in the English NHS as well as clinical guidelines (Vandoros & Stargardt, 2013]. However, if they are not carefully designed and adjusted for each physicians' patients' demographic and other characteristics, they may provide a barrier to access to care (Petrou & Vandoros, 2015).

This research has its own limitations. First further evaluation is needed to define whether these data on medicine prescription correlates with the epidemiologic profile of the regions. Second, further assessment will show how the trend was in previous years. We hope that our research enhances the scientific dialogue among the stakeholders of the country and abroad to the issue of monitoring prescribing patterns.

5. Conclusion

The e-prescribing system is an appropriate information system provides data necessary for the systematic monitoring of prescribing patterns of doctors e.g., whether quality of care standards are being followed correctly. Moreover, the analysis of spending distribution per physician specialty and geographical region underscored the need of specific measures in order to regulate pharmaceutical spending.

Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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