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A quasi-experimental study for inappropriate laboratory utilization from a payer perspective in Cyprus

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ABSTRACT

Objective: Laboratory tests have progressively acquired a dominant role in screening, diagnosis, disease monitoring and outcome assessment. This trend has also adversely led to the inappropriate ordering of laboratory tests, the results of which are highly unlikely to establish or change diagnosis, and, in extent, influence the treatment decision-making of a specific disease. This practice raises the cost of healthcare while it exposes patients to unjustified risk as healthcare professionals may be led to perform unnecessary procedures.

Study Design: A quasi-experimental study in the form of an interrupted time series analysis was performed to assess the potential impact of introduction of co-payment on cholesterol test ordering.

Methods: This study was performed using public health care sector data from Nicosia General Hospital and Nicosia primary health care centers. Daily ordering for all outpatient cholesterol tests were tracked for 43 consecutive months; 33 months prior to, and 10 months after the introduction of this measure.

Results: Co-payment resulted in an instant and significant reduction in cholesterol test ordering. The measure's impact remained unchanged throughout the observation period.

Conclusion: Co-payment can be considered to be a potent and durable measure to successfully contain inappropriate laboratory ordering. However, the long–term effect of this measure must be assessed to ensure that co-payment does not exert a negative effect on public health.

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Introduction

The utilisation of laboratory examinations constitutes a vital part of medicine practice across all medical specialties. Laboratory tests reached the peak of their popularity due to their dominant role in the screening, diagnosis, disease monitoring and outcome assessment. Laboratory tests are best defined by their "little-ticket" attribute [1]. Little-ticket technologies are characterised by:

- Low unit cost.
- Relatively simple procedure which does not require expensive or sophisticated equipment.
- High volume.

Consequently, laboratory ordering was established as the highest single health activity volume all over the world, while this number has been inflated significantly by inappropriate ordering, which accounts for up to 20% of total laboratory expenditure [2,3]. The inappropriate laboratory ordering is defined as the ordering of tests, whose result is highly unlikely to establish diagnosis and change diagnosis or treatment of a specific disease [1,2]. Counter to common perception, the increase of performed tests does not correlate to improved health outcomes [3,4]. In many countries, as in Cyprus, the laboratory ordering forms feature a ticking box. This attribute makes laboratory ordering an easy task and, in fact, doctors may subconsciously order tests, due to the relative ease to do so, a process described as the thoughtless tick-box procedure. [5]. Moreover, due to the tests' simplicity and perceived low cost, physicians continue practices, such as the in-patient ordering of daily tests, which do not further contribute to diagnosis or monitoring of patients, or even ordering obsolete tests without any value on patient management [2]. The overutilization of lab ordering burdens health expenditure, encumbers health care professionals with unnecessary procedures and exposes patients to unjustified risk [6]. Moreover, it increases the probability of false positive results, which may subsequently lead to unnecessary medical interventions, further exposing patients to excessive risk.

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From a broader perspective, inappropriate laboratory ordering may be an indication of health professionals' inefficiencies, along with deficits in the universal approach in the treatment of a health condition, namely lack of clinical pathways [7]. Consequently, the vast majority of measures applied towards reducing inappropriate laboratory ordering have been focussing on altering physicians' behaviour, including measures such as redesigning of order forms [8], requesting additional clinical justification for expensive tests [9] and providing physicians education with feedback [10].

The inappropriate ordering of laboratory tests is also imputed to the adoption of an excessive medical paternalistic approach towards patient welfare [11]. Inappropriate ordering escalates to the increase of health expenditure while it does not establish any evidence of bringing about corresponding improvement in patient care outcomes, which unavoidably perpetuates to an allocatively inefficient outcome [12].

The use of co-payment has been extensively applied in many countries, as a combative measure towards reducing demand-side increase of health utilization and curbing use of low value services. Overall, it has been proven to be a potent measure in minimising polypharmacy and Emergency Room (ER) overuse [13]. The notion of co-payment stems out of neoclassical economists who argue that the use of healthcare services goes beyond socially beneficial level, if no costs incur to the user. Apparently, this inappropriate use of services will eventually lead to loss of social welfare within the community, since finite resources could be utilized more efficiently and effectively serving a larger number of individuals in need of such services. In addition, co-payments serve as a health system revenue stream. Not only that, varying co-payment levels can serve in influencing patient behaviour channelling them towards more cost-effective options, e.g introduction of higher co-payment rates when patients visit a specialist directly circumventing their general practitioner (GP). Conceptually, co-payment aims at increasing patient-side responsibility. In this case, and given that patients overuse the system, co-payment can restrain costs since there is a gap between total societal costs and cost borne by the patient. In Cyprus, public health sector provides free treatment to patients based on socioeconomic criteria, while it offers free health care for chronic conditions regardless income. An ill-construed conception of how a health system should operate, led to lack of any demand-side measures. As a result, health system was massively exploited, as it is evidenced by persisting polypharmacy, excessive laboratory prescribing and extensive Hospital Length-of-Stay. Another feature of the public health sector is the lack of clinical pathways.

In 2013, Cyprus applied for a bailout agreement due to fiscal crisis. Internationals lenders underlined the importance of reforms in public health services in order to reduce cost and increase efficiency. Their primary assessment identified overutilization of laboratory exams [14]. One of the portentous measures was the introduction of co-payment, in a fixed and capped form of 0.5 euro per test, capped at 10 euro per visit, for laboratory exams, aiming to address overutilization.

To this direction, the aim of this study is to assess the impact of co-payment on cholesterol test ordering.

Measurement of serum lipids is pivotal for the assessment of cardiovascular disease (CVD) risk, since a strong correlation between elevated cholesterol levels and prevalence of CVD has been established. In addition to this, cholesterol lowering using statins demonstrated significant mortality reduction, both short-and long-term. These agents are commercially available and many of them are off-patent, which translates into very low cost for the payer. Consequently, their clinical use is widespread and the awareness for lipidemic control is very high, an attribute which has led to overuse of cholesterol test worldwide as well [14]. Current guidelines recommend screening in people over 40 years old, while in younger cohorts, screening is recommended for high-risk patients only.

Methods

In order to assess the impact of co-payment on laboratory ordering, we delineated certain criteria in order to select a laboratory test, which would serve as the theme of this study to test the hypothesis for the impact of co-payment on laboratory ordering. Our selection criteria were:

- High volume
- Significant burden on healthcare expenditure
- Lack of specific guidelines regulating the ordering thereof

Based on the above we identified cholesterol tests, which are used for diagnosis and monitoring of cardiovascular conditions and they are classified among the five highest volume and value ordered tests. Moreover, although explicit qualitative criteria for cholesterol levels have been defined and have been adopted both by health agencies and physicians, a significant gap exists with regards to when and how often these tests should be performed [15].

We used public health care sector data regarding the number of cholesterol tests performed in Nicosia and the greater Nicosia area, collected both from the General Hospital as well as the primary health care centres, which altogether provide healthcare services to approximately 200,000 beneficiaries. For the scope of the study we collected data on total cholesterol, HDL and LDL tests. The test numbers are defined as the variables of the model.

Data were collected on a daily basis for 43 months, starting in January 1st 2011 and spanned 33 months prior to and 10 months after the introduction of co-payment, which was introduced in August of 2013. The data indicated that at the Nicosia General Hospital alone, approximately 90,000 tests are performed annually, a rather high number taking into consideration Nicosia's 200,000 general population. We analysed data based on specific age groups (20–29,30–39,40–49,50–59, 60–69, and people over 70), hospital/outpatient centre status and sex.

We defined an interrupted time series (ITS) autoregressive integrated moving average models of monthly number of cholesterol tests performed in Cyprus. ITS uses repeated measures of a specific variable (in our case number of test performed daily) and it can compare trajectory with regards to a specific data, at which the intervention occurred [16]. One important attribute of ITS is that, in contrast to simpler models such as the t-test, ITS takes into consideration any underlying trend prior to the intervention, meaning that the ITS approach controls for the effect of secular trends. Therefore, it does not simply compare two means, prior and post intervention but it also controls for the trend. Moreover, it allows for tracking change in level (change in intercept and slope). One important aspect of ITS is the ability to perform analysis at the population instead of the individual level. Thus, individual level variables are rather unlikely to constitute serious bias. Moreover, ITS allows stratified analysis, as in the case of age groups. ITS also ignores any trends, both before and after change in intervention. ITS can track down possible cyclical effects and take account of potential autocorrelation. It is also important that ITS works regardless whether effects are immediate or delayed. We developed a model as following:

$$Y = \alpha o + \alpha time + \alpha 2inte + \alpha 3postintertime + er$$

In our model Y is the average number of cholesterol tests performed per month. *time* is a continuous variable which indicates time from the beginning of the study. Intervention *(inte)* is a binary variable with value of 0 prior to the introduction of co-payment and value of 1 after the introduction of co-payment. *Postintertime*

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