Prescribing patterns of physicians working in both the direct and indirect treatment sectors in Iran; findings and implications

(Running header: Prescribing patterns in Iran)

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Abstract

Objective: There can be different incentives in the private versus public healthcare systems across countries influencing the delivery of healthcare. The implementation of regulations along with financial incentives and quality targets are key initiatives to improve rational prescribing. However, there are concerns in Iran that the different incentives in the Direct versus Indirect sectors can influence the delivery of care even among the same physicians. Consequently, the objective of this study is to evaluate the effect of Social Security Organisation (SSO) rules and regulations on physician prescribing patterns working simultaneously in both sectors of the SSO in Iran. Subsequently use the findings to suggest initiatives to improve future prescribing if needed. **Methods:** Retrospective cross-sectional study on claims data. All prescriptions written by general practitioners, internists, gynecologists and pediatricians that had at least 100 claims and working in both sectors were collected. Non-parametric tests were undertaken to compare prescribing patterns. **Key findings:** 455549 prescriptions were analyzed. The average number of medicine items per prescription was 4 in the direct treatment setting versus 2 in indirect treatment setting, while the proportion of prescriptions including at least one antibiotic, injectable, corticosteroid, and injectable corticosteroid, were 31.5%, 16.1%, 8.7% and 3% respectively in the indirect treatment setting versus 28.7 %,13.7%, 7.7% and 3.2% in the direct treatment setting. Except for antibiotic prescribing, all other differences were significant. **Conclusions:** There are a number of areas of potential concern with physician prescribing in this study. These include the high use of antibiotics in both sectors, potentially inappropriate polypharmacy in the Direct sector, as well as possibly the overuse of injections especially in the Indirect sector, increasing costs and potentially patient harm. These will be the subject of future research projects.

Keywords: Rational medicine use; Social security organization; Regulations; quality indicators; Iran

1. Introduction

The inappropriate use of medicines is a global concern (1). Patients, clinicians, healthcare systems and pharmaceutical companies' behaviors, practices, and strategies, can adversely affect the quality of medicine use (2-5)**Error! Reference source not found.**. Their inappropriate use is enhanced by patients putting pressure on physicians and pharmacists to prescribe and dispense antibiotics for self-limiting viral infections (2, 6, 7) and physicians through inappropriate prescribing of antibiotics as well as inappropriate polypharmacy (2, 8-10). Health systems can also exacerbate inappropriate prescribing through incentive systems encouraging for instance greater use of injections where oral medicines would suffice and prescribing branded medicines instead of generics, increasing costs and potentially harming patients (11-14). Pharmaceutical companies can enhance inappropriate prescribing through promotional and other activities potentially adding to costs and harming patients through selective disclosure of information (5, 15-18). Pharmaceutical company activities also include campaigns to help maintain sales of their originator products by casting doubt on generic alternatives thereby increasing costs, which have resulted in fines (19, 20).

Initiatives to enhance appropriate medicine use include education among patients and physicians regarding generics, leading for instance to high acceptance of international non-proprietary name (INN) prescribing in the UK (21-23), instigating formularies and treatment guidelines using robust methodologies leading to high acceptance and use of a limited number of medicines without compromising care, as seen with the 'Wise List' in Stockholm, Sweden (24, 25), quality indicators coupled with financial incentives to appreciably enhance the prescribing of generics in a class to save considerable resources without compromising care (21, 26, 27), as well as instigating prescribing restrictions for physicians to limit the use of medicines where concerns with either their costs or patient safety (28-30). However, policies and initiatives should be organized judiciously, by benchmarking and conducting surveillance, to assess their influence and plan additional interventions if needed (31). This is especially important as quality initiatives can have unexpected consequences. For instance in the UK, non-incentivized indicators were significantly below projections from pre-Quality and Outcome Framework instigation in view of the level of financial incentives involved (32), and updated GP targets in the UK to enhance the prescribing of generic versus patented medicines affecting the renin-angiotensin system had limited impact in reality. This is because these targets were instigated some years after formularies and other measures had already limited the prescribing of premium priced patented angiotensin receptor blockers in the UK, producing similar impressive results to those achieved in Austria and Croatia with prescribing restrictions (22, 33). We are also aware that initiatives to impose INN prescribing among physicians in Abu Dhabi did not achieve the desired outcomes due to limited demand side-measures among physicians and pharmacists still allowed to dispense either a generic or an originator and be fully reimbursed (34).

The International Network for Rational Use of Drugs (INRUD), and the WHO Action Program on Essential Drugs, have developed a number of indicators to measure appropriate medicine use. These indicators can be grouped into three broad categories: Prescribing indicators, Patient care indicators and Facility indicators. Prescribing indicators include the average number of drugs per encounter, the percentage of drugs prescribed by generic name, the percentage of encounters where an antibiotic is prescribed, the percentage of encounters where an injection is prescribed and the percentage of drugs prescribed from an essential medicine list or formulary (35-38). Having said this, there are concerns whether the INRUD indicators actually measure the quality of care in practice, and indicators surrounding issues such as guideline adherence may be more appropriate to measure the quality of prescribing (38-40). However, the INRUD criteria are still considered as standards for assessing prescribing practices across countries (35).

In Iran, the Social Security Organization (SSO) was founded as a social insurer organization in 1975. SSO is the second largest health service provider in the country after the Ministry of Health. SSO has nearly 350 inpatient and outpatient treatment centers in the Direct sector, 46278 centers in the Indirect sector, with currently more than 39 million people under its coverage. The medical section of the SSO provides health services to the insured in two ways – the Direct and Indirect treatment sectors. In the Direct treatment sector, all health care facilities are owned by SSO and typically all health services are provided to patients free of charge including medicines. In the Indirect treatment sector, SSO purchases clinicians' services and, as a result, outpatients' payment will be 30% in addition to the cost of any medicines prescribed (41). While there is less physician monitoring in the Indirect sector, the Direct treatment sector has defined regulations for following up prescribing

patterns. Scientific committees audit and supervise physician prescribing patterns to evaluate the current situation and improve future practice. As a result of the financial incentives involved, patients that are under coverage of the SSO are more likely to preferentially go to the Direct treatment sector to be treated. However, this puts considerable pressure on the Direct treatment sector leading to long waiting times. Consequently, patients who can afford it, and want quicker and easier access to care, typically prefer to go to Indirect treatment centers. This is the principal difference between the patients in the two sectors.

Considering the fact that most physicians involved with the SSO practice in both the Direct and Indirect sectors, and based on observed published differences in prescribing habits between private and public facilities and professional (42-48), this study aimed to evaluate the effect of SSO regulations and physician monitoring in the Direct sector, and to identify the extent of any differences between the same physicians' prescribing behaviors in these two sectors. The results will help to demonstrate the extent of any differences in the prescribing patterns of the same physician working concurrently in different sectors, and the resultant implications for future care delivery.

2. Materials and Methods

A retrospective cross-sectional study was conducted on claims data of the SSO in Tehran city to evaluate the quality of care provided based on WHO indicators. All prescriptions written by general practitioners, internists, gynecologists, and pediatricians, that had at least 100 claims and were working in both the Direct and the Indirect treatment sector of social security organization were collected.

The information analyzed including prescribed items, their dosage forms, the number of medicines per prescription and the cost of prescriptions, based on INRUD and WHO recommendations. These included: (i) the average number of medicine items per prescription; (ii) the average cost per prescription; (iii) the proportion of prescribed injectable medicine items; (iv) the proportion of prescribed antibiotic medicine items; (v) the proportion of prescribed corticosteroids and (vi) the proportion of prescribed injectable corticosteroid medicines (35, 38). We included corticosteroids in view of the potential for abuse and associated side-effects (49). In addition, previous studies have shown that financial incentives can result in their over use (49). This over use or abuse of corticosteroids is similar to the prescribing of medicines by injection when the oral route would have produced the same outcomes (12, 49, 50). However, there was no patient level data available enabling a thorough analysis of the casemix of the patients in both sectors and between the different specialists.

We chose Tehran city for this initial analysis as we believed it most likely that we would be able to identify physicians working in both sectors here and it has the high density of Direct and Indirect sector facilities. Statistical testing included the Wilcoxon, Man-Whitney, Kruskal- Walis and Spearman using IBM SPSS Statistics 22. We did not perform odds ratios (OR) or risk ratios (RR) as the outcomes of interests are not binary.

The study was authorized by Tehran University of Medical Sciences, with funding for the study received from the Pharmaceutical Management & Economics Research Center of the University.

3. Results

Seventy three physicians met the inclusion criteria (Table 1) broken down by different specialties. There were 35 males and 38 females, with a median age of 51 and 49 years respectively. In total, 455549 prescriptions were collected and analyzed (Table 1).

Insert Table 1

As seen in Table 2, all the items except the prescribing of antibiotics, were significantly different when the same physicians were prescribing in either the Direct or Indirect sectors.

Insert Table 2

We further evaluated the effect of gender on prescribing patterns between the sectors using the Mann-Whitney test (Table 3).

Insert Table 3

Female physicians in the Direct sector were most likely to prescribe an antibiotic (p=0.22), although there was no difference in their prescribing whether they practiced in the Indirect compared versus the Direct treatment sector (Table 3). However, male physicians in the Indirect sector had over a 50% higher rate of antibiotic prescribing versus their prescribing when in the Direct sector, making their prescribing rates similar to female physicians in the Indirect sector (Table 3).

Male physicians in both sectors were appreciably more likely to give an injection generally (p= 0.009 to 0.027) and for corticosteroids (p<0.001) than female physicians as well as more likely to prescribe more medicines per prescription (p<0.001 to 0.019). Prescribing costs were higher for female physicians in the Indirect sector (p = 0.002) although similar (p=0,53) in the Direct sector (Table 3).

We also evaluated whether prescribing patterns were different among the different specialist types across the sectors using the kruskal walis methodology (Table 4).

Insert Table 4

Antibiotics were mostly included in pediatrician prescriptions whether working in either the Direct or Indirect treatment sectors. Overall, the difference between patterns of prescribing in all indicators, except corticosteroid medicine items, was significant between the different specialties (Table 4), with the cost of prescriptions in the Indirect sector significantly higher than the Direct sector (Table 3). The highest mean cost per prescription belonged to the Internists in both sectors with the Gynecologists having the lowest average prescription cost in the Direct sector, with the GPs having the lowest average prescription cost in the Indirect sector (Table 4).

4. Discussion

Our findings (Tables 2 to 4) showed significant differences in the prescribing behavior of the same physician when moving between the Direct and Indirect treatment sectors of the SSO. However, we were unable to find any similar study that considered the impact of regulations on the same physicians' prescribing patterns as they oscillate between different sectors. Most publications contrast differences in medicine utilization patterns between the sectors with typically different physicians (35, 42, 46-48, 51). Consequently, we have made indirect comparisons to help with the interpretation of our results to provide future guidance, although we are aware of the lack of casemix data.

The average number of medicines per prescription, i.e. 2 to 4, were similar to Karimi *et al* at 3.07 for Iran (52), as well as similar to other lower and middle income countries (LMICs), i.e. in Mali (3.2), Yemen (3.0), Uganda (2.9), Thailand (2.85), Pakistan (2.7), India (2.4), Saudi Arabia (2.08), Malaysia (2.0), Botswana (2.8), Namibia (1.6 – 3.1), Tanzania (2.2), and consolidated findings among 11 African countries (3.1) (35, 38, 40, 53).

A higher number of medicines per prescription among physicians when working in the Direct treatment sector could be the result of no co-payments, patient demand or differences in patient co-morbidity and characteristics (Table 2). It is difficult to state which one without further research, including analyzing differences in casemix between the sectors. This needs investigating further, and we will be following this up in future research projects.

Inappropriate polypharmacy can increase adverse drug reactions and drug-drug interactions as well as reduce adherence rates, negatively impacting on patient outcomes and increasing costs (9, 54), and the inappropriate use of antibiotics increases resistance, morbidity, mortality and costs (2, 55-58). In our study, the proportion of antibiotics prescribed per visit was 28.7% and 31.5% in the Direct and Indirect sectors, respectively (Table 2). This extent suggests inappropriate prescribing for potentially viral infections such as upper respiratory tract infections (URTIs) (2, 8, 59, 60). However, this needs further investigation before commenting further. These rates of antibiotic prescribing are lower though in Iran compared with Botswana, India, Laos, Namibia, Nigeria, Pakistan, Sri Lanka, Sudan, Yemen

and Zimbabwe (40, 53, 61), as well as combined African countries (35, 38, 48), but higher than seen in Saudi Arabia (62).

The proportion of the injectable medicine items also appeared high at 13.7% and 16.1% in the Direct and Indirect treatment sectors respectively. This is a concern if this drives up costs and potential harm to patients when oral medicines are adequate and less expensive. Having said this, these rates were lower than seen in studies in Namibia, Nigeria, Uganda and Sudan (36%–50%) (38, 63) as well as one review involving 18 studies from six African countries at 32.3% in the public sector rising to 38% in the private sector (48), and among 11 African countries at 25% (35), as well as lower than WHO guidance for developing countries at <20% (35). However, higher than rates seen in Sudan (13%) (53). The higher rate in the Indirect sector (Table 2) may reflect the potential for physicians to make more money from prescribing injections as seen in China where physicians and hospitals make most of their income from prescribing higher cost medicines including injectables (49, 50). The higher use of injections in the Indirect sector may also have been linked to perceptions of increased effectiveness with this route versus the oral route (64), potentially increasing patient satisfaction. However, this needs to be investigated further and addressed if excessive use of injections is potentially harming patients and increasing expenditure.

This study suggested that gender can affect prescribing patterns. In both sectors, male physicians tended to prescribe more medicines per prescription as well as more injections than female physicians (Table 3). However, this again needs investigating further, including any casemix differences, before any definitive statements can be made. If further research confirms this, the findings will be contrary to those of Orzella et al and Wang et al (37, 65), although similar to those of Karimi *et a*l (52).

Another potential cause for concern is that Pediatricians, particularly when practicing in the Indirect sector, appeared more likely to prescribe antibiotics than other physician categories (Table 4). This may reflect pressure by parents to prescribe antibiotics for their children with URTIs, with fears that parents may go to another physician in the Indirect sector if they do not prescribe an antibiotic for their child (2, 66). However, further research is again needed before any definitive strategies can be developed. The high cost of prescribing by internists also needs further investigation (Table 4).

We accept there are a number of limitations with this study. A major issue is the lack of casemix data. In view of the lack of patients' demographic and diseases information, a precise rationalization of the difference between the Direct and Indirect sector indicators is impossible. Other limitations include the fact that we only conducted the study in one city. We are also aware that we did not undertake any qualitative research among physicians to explore some of the prescribing differences seen when they oscillate between the sectors. In addition, we did not perform odds ratios (OR) or risk ratios (RR) since, as mentioned, the outcomes of interests are not binary. However, despite these limitations, we believe that in view of large number of prescriptions that were analysed, and the significant differences seen between the sectors, that the findings will be applicable to other cities in Iran and help guide future initiatives especially in the Indirect sector. We will also use these findings to guide future research in Iran, including both qualitative research as well as patient level data, to improve the quality of patient care across all sectors in Iran in the future.

5. Conclusion

We believe this is one of the first studies assessing prescribing differences among the same physicians depending which sector they practice in. Our study has highlighted a number of areas of concern that need to be investigated further. These include the potential overuse of antibiotics, the possibility of inappropriate polypharmacy especially in the Direct sector, and the potential overuse of injections especially injectable steroids among male physicians. Further planned research, including both qualitative interviews and patient level data, will help to develop and refine potential interventions and strategies that could be instigated in Iran to improve future patient care in both sectors. This can include the development of more specific quality indicators.

In the meantime, potential strategies that could be introduced in Iran include educational initiatives among both patients and physicians to reduce inappropriate prescribing of antibiotics as well as initiatives to reduce the use of injections unless there is a medical necessity. We have seen multiple initiatives lead to success in other countries to reduce inappropriate prescribing of antibiotics. In

addition, potentially educational and other initiatives in the Direct sector to reduce inappropriate polypharmacy where this exists, building on activities in other countries (9, 67).

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