Background: Apart from having a negative impact on work flow in practice, prescription errors may pose a threat to patient safety. Such errors have been reported in the pharmaceutical services in spite of the clear guidelines issued by the parent organization.

Objective: This study was to explore the degree of conformity to the prescribing guidelines at Primary Care level in the Saudi National Guard Health Affairs in Riyadh.

Methods: Prescriptions were collected during audits done fortnightly through a simple random selection from a sampling frame of all prescriptions given within the period. Information about each prescription was entered in a database by the pharmacists and each prescription was classified according to its conformity to the guidelines. Information was presented on 330 prescriptions for eleven audits carried out from September 2004 to February 2005.

Results: 87% of the prescriptions did not conform to the given guidelines. Less than 1% of the inconsistencies were potentially harmful to the patient, 77.8% had possible negative effect on the pharmacist’s work, while 21.3% were unimportant. Patient information was deficient in 16.9% of cases, drug information in 49.6% and archiving/record information related non-conformities constituted 33.5%.

Conclusions: Conformity to prescribing guidelines is quite low in spite of the significant input of resources by the parent organization. This burden on work flow, utilization of time and service delivery needs to be studied and addressed by ensuring that there are periodic audits in the work routines of primary health care, and a feedback given to the care providers.

Key Words: Prescription, prescribing, general practitioner, primary health care, pharmacy, non-conformity, audits.

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INTRODUCTION
Primary Health Care (PHC), as an entry point of the health system is the cornerstone of the health services. With the huge workload and the volume of patient flow at primary care facilities, the chances of errors and inconsistencies of writing and keeping records are more likely to occur in the work of the care providers than their colleagues in other clinical settings. Such errors can be particularly deleterious when these occur in prescription writing.

Prescribing is a major interventional activity performed by physicians in most healthcare facilities and especially general practitioners (GPs) in primary health care settings. Most consultations in primary care results in a prescription, as the prescription of a drug hastens the termination of a primary care consultation. This pattern of preferential prescribing with two or more drugs prescribed for each patient per consultation is universal. During the long hours of work, GPs see a large number of new patients who, more often than not, present with a wide range of symptoms of mostly undifferentiated and complex medical conditions. The diagnostic task is even more challenging for GPs, since most primary care facilities lack the full range of laboratory and other investigational facilities, which could aid the process of a correct early diagnosis.

High patient flow, short consultation times, and the required diversity of knowledge and diagnostic skills render the making of diagnosis and prescribing rather difficult with the result that the probability of errors with potentially serious consequences is increased.

Prescription errors consist of a whole spectrum of issues ranging from polypharmacy and the use of non-generic drug names to failures to record patient, provider, drug, or dispensing information. These errors are universally reported across various domains, disciplines, and drugs and may range from the trivial to what is potentially dangerous to the patient. They also affect work flow in the practice, especially in the pharmacy, causing unnecessary delays in dispensing, and affecting the quality of communication with patients.

Studies in Saudi Arabia have shown that a high proportion of prescriptions may be inappropriately written with errors ranging from the trivial to the potentially dangerous, highlighting concerns about prescribing habits and patterns. Failures to record patient weight, drug dosage, duration of treatment, generic drug names, and illegibility of handwriting have been among the problems reported.

The provision of clear prescribing guidelines is a definite step towards eliminating these errors. Such guidelines have been provided by the pharmaceutical services of National Guard Health Affairs, although the degree of compliance with these guidelines has not been systematically assessed.

The current study is aimed at reducing these errors by estimating the level of compliance to the provided guidelines in order to develop and incorporate a systematic assessment process in prescription errors in PHC and provide the care providers with a feedback.

METHODS
Simple random samples of 30 prescriptions were chosen every fortnight from a sampling frame of all prescriptions collected during the period. The current study is based on the analysis of a set of 330 prescriptions from 11 audits, carried out from September 2004 to February 2005. This sample size provides more than 90% power to detect a difference of 10% from the assumed proportion of non-conforming prescriptions at 50%.

Every prescription was checked for compliance to the 14 components provided in the guidelines; file number, age, weight, diagnosis, generic drug name, dose specification, frequency specification, duration specification, use of standard abbreviations, absence of contraindications (including interactions), pharmacist’s name record, doctor’s name record, date record and legible hand writing. Information from each selected prescription was entered in a specially prepared database using Epidata. Based on yes-no answers to the status of compliance to the 14 indicators, an automated decision was generated by a computer system on the conformity of the prescription with the guidelines. Personal information on the patients or the prescribers was held back for reasons of confidentiality.

For the feedback to care providers, non-conformities were classified according to the component of prescribing process involved... patient, provider, prescribing, drug / dispensing or others (Table 1). A second classification, used by
Table 1: Prescription non-conformities according to the component involved

| Missing component / Variable | Proportion of non-conformities (n=750) | Proportion of prescriptions (n=330) |
|-----------------------------|----------------------------------------|-----------------------------------|
|                             | Count % 95% CI                         | Count % 95% CI                    |
| Patient information         |                                        |                                   |
| Medical record number       | 6 % 17.7 15.1 - 20.6                   | 120 % 36.4 31.2 - 41.8            |
| Age                         | 9 %                                    | 139 % 42.1 36.7 - 47.6            |
| Weight                      | 112 % 17.7 15.1 - 20.6                 | 139 % 42.1 36.7 - 47.6            |
| Diagnosis                   | 6 % 17.7 15.1 - 20.6                   | 139 % 42.1 36.7 - 47.6            |
| **Total**                   | 133 % 17.7 15.1 - 20.6                 | 120 % 36.4 31.2 - 41.8            |
| Provider information        |                                        |                                   |
| Doctor's name               | 2 % 12.1 9.9 - 14.7                    | 75 % 22.7 18.3 - 27.6             |
| Pharmacist's name           | 138 % 18.7 15.9 - 21.6                 | 139 % 42.1 36.7 - 47.6            |
| **Total**                   | 140 % 18.7 15.9 - 21.6                 | 139 % 42.1 36.7 - 47.6            |
| Prescribing process         |                                        |                                   |
| Non-standard abbreviations  | 65 % 12.1 9.9 - 14.7                    | 75 % 22.7 18.3 - 27.6             |
| Illegible hand writing      | 26 % 12.1 9.9 - 14.7                    | 75 % 22.7 18.3 - 27.6             |
| **Total**                   | 91 % 12.1 9.9 - 14.7                    | 75 % 22.7 18.3 - 27.6             |
| Drug and dispensing information |                                        |                                   |
| Generic name                | 217 % 49.6 46.0 - 53.2                  | 232 % 70.3 65.0 - 75.2            |
| Dose                        | 27 % 12.1 9.9 - 14.7                    | 75 % 22.7 18.3 - 27.6             |
| Frequency                   | 39 % 12.1 9.9 - 14.7                    | 75 % 22.7 18.3 - 27.6             |
| Duration                    | 82 % 12.1 9.9 - 14.7                    | 75 % 22.7 18.3 - 27.6             |
| Contraindications           | 7 % 12.1 9.9 - 14.7                    | 75 % 22.7 18.3 - 27.6             |
| **Total**                   | 372 % 49.6 46.0 - 53.2                  | 232 % 70.3 65.0 - 75.2            |
| Others                      |                                         |                                   |
| Prescription date (Total)   | 14 % 1.9 1.0 - 3.1                       | 14 % 4.2 2.3 - 7.0                |

Table 2: Prescription non-conformities according to potential harm to patient

| Error type / Variable      | Proportion of non-conformities (n=750) | Proportion of prescriptions (n=330) |
|----------------------------|----------------------------------------|-----------------------------------|
|                            | Count % 95% CI                         | Count % 95% CI                    |
| Type A                     |                                        |                                   |
| Contraindicated drug       | 7 % 0.9 0.4 - 1.9                       | 7 % 2.1 0.8 - 4.3                  |
| **Total**                  | 7 % 0.9 0.4 - 1.9                       | 7 % 2.1 0.8 - 4.3                  |
| Type B                     |                                        |                                   |
| Patient weight not recorded| 112 % 40.2 36.6 - 43.7                  | 174 % 52.7 47.2 - 58.2            |
| Patient age not recorded   | 9 %                                     | 7 % 2.1 0.8 - 4.3                  |
| Diagnosis not recorded     | 6 %                                     | 7 % 2.1 0.8 - 4.3                  |
| Dose not recorded          | 27 % 40.2 36.6 - 43.7                   | 174 % 52.7 47.2 - 58.2            |
| Duration of therapy not written | 82 % 40.2 36.6 - 43.7                  | 174 % 52.7 47.2 - 58.2            |
| Frequency of medication not written | 39 % 40.2 36.6 - 43.7                  | 174 % 52.7 47.2 - 58.2            |
| Prescription not legible   | 26 % 40.2 36.6 - 43.7                   | 174 % 52.7 47.2 - 58.2            |
| **Total**                  | 301 % 40.2 36.6 - 43.7                  | 174 % 52.7 47.2 - 58.2            |
| Type C                     |                                        |                                   |
| Non-standard abbreviations  | 65 % 37.6 34.1 - 41.2                   | 232 % 70.3 65.1 - 75.2            |
| Generic name not recorded  | 217 % 37.6 34.1 - 41.2                  | 232 % 70.3 65.1 - 75.2            |
| **Total**                  | 282 % 37.6 34.1 - 41.2                  | 232 % 70.3 65.1 - 75.2            |
| Type D                     |                                        |                                   |
| Pharmacist's name not recorded | 138 % 21.3 18.5 - 24.4                 | 144 % 43.6 38.2 - 49.2            |
| Doctor's name not recorded | 2 %                                     | 14 % 4.2 2.3 - 7.0                |
| Medical record number not recorded | 6 % 21.3 18.5 - 24.4                 | 14 % 4.2 2.3 - 7.0                |
| Date not recorded          | 14 % 21.3 18.5 - 24.4                   | 14 % 4.2 2.3 - 7.0                |
| **Total**                  | 160 % 21.3 18.5 - 24.4                  | 144 % 43.6 38.2 - 49.2            |

Neville et al., 17 based on potential harm to the patient, was also used (Table 2).

According to the later classification, type A errors are ‘potentially serious to the patient’, meaning that the prescription would be dangerous if dispensed. Type B errors are ‘major nuisance’, meaning that the pharmacist may have to contact the physician before being able to correctly dispense the prescription; type C errors are a ‘Minor Nuisance’ if the pharmacist has to make a professional decision before dispensing the prescribed medication, and type D termed ‘trivial’ errors, have no serious consequence though the prescription does not conform to the guidelines.

For all class A, B and C errors handled through the current system of error management...
in pharmaceutical services, the concerned pharmacist would contact the physician by telephone and send a feedback to him on a standard form highlighting the error. The physician, after making the necessary correction on the prescription, would send it back to the pharmacy. Class D errors, as well as other errors are reported to the clinicians, without the names of the concerned employees, during continuing education sessions in the center.

**DATA ANALYSIS**
Proportions are presented as percentages in the format #.##(± standard deviation). Exact binomial confidence intervals are used to estimate parameters for binary variables. Analyses were carried out with Stata Version 8.2(21), Epi-Info 6.04d(22), and R version 2.0.1(23).

**RESULTS**
Out of 330 selected prescriptions 288(87.3%) did not conform to the given guidelines (95% CI: 83.2 – 90.7), while only 42(12.7%) did (95% CI: 9.3 – 16.8). The mean number of those that did not conform was 2.3 (±1.8), with a range of 0 – 8 per prescription. Forty two out of 330 (12.7%; 95% CI: 3.3-8.5) prescriptions fully conformed to the given guidelines (Table 3). The same number of prescriptions did not conform in five areas.

| No. of non-conformities | Frequency of prescriptions No. (%) | 95% CI |
|-------------------------|------------------------------------|--------|
| 0                       | 42 (12.7)                          | 9.3-16.8|
| 1                       | 88 (26.7)                          | 22.0-31.8|
| 2                       | 83 (25.2)                          | 20.6-30.2|
| 3                       | 49 (14.8)                          | 11.2-19.2|
| 4                       | 26 (7.9)                           | 5.2-11.3|
| 5                       | 18 (5.4)                           | 3.3-8.5 |
| 6                       | 15 (4.6)                           | 2.6-7.4 |
| 7                       | 7 (2.1)                            | 0.8-4.3 |
| 8                       | 2 (0.6)                            | 0.1-2.2 |
| Total                   | 330 (100)                          |        |

Table 3: Number of non-conformities per prescription

A total of 750 instances of non-conformity were noted in the 330 prescriptions (Tables 1, 2 & 4). The most frequent non-conformity was that of a failure to write generic drug name (28.9% of the non-conformity; 95% CI: 25.7-32.3) Failure to record pharmacist’s name, patient weight and duration of therapy constituted 18.4 % (15.7-21.4), 14.9% (12.5-17.7) and 10.9% (8.8-13.4) of the non-conformity (Table 4).

![Table 4: Distribution of prescription non-conformities](image)

Table 4: Distribution of prescription non-conformities

| Variables lacking or not recorded | NCT(%) | 95% CI** |
|-----------------------------------|--------|----------|
| Generic name                      | 217 (28.9) | 25.7-32.3 |
| Pharmacist's name                 | 138 (18.4) | 15.7-21.4 |
| Patient's weight                  | 112 (14.9) | 12.4-17.7 |
| Duration of therapy               | 82 (10.9)  | 8.8-13.4  |
| Non-standard abbreviations         | 65 (8.7)   | 6.7-10.9  |
| Frequency of medication           | 39 (5.2)   | 3.7-7.0   |
| Dose                              | 27 (3.6)   | 2.4-5.2   |
| Prescription not legible           | 26 (3.5)   | 2.3-5.0   |
| Date                              | 14 (1.9)   | 1.0-3.1   |
| Patient's age                     | 9 (1.2)    | 0.5-2.3   |
| Contraindicated drug              | 7 (0.9)    | 0-4.1     |
| Diagnosis                         | 6 (0.8)    | 0.3-1.7   |
| Medical record number             | 6 (0.8)    | 0.3-1.7   |
| Doctor's name                     | 2 (0.3)    | 0.0-0.9   |
| Total                             | 750 (100)  | **       |

*NCI=Non-conformity instances
**CI=Confidence interval

Only 2.1% of the prescriptions (95% CI: 0.8 – 4.3) contained a type A error accounting for 0.9% of all non-conformity (95% CI: 0.4 – 1.9). Type B errors, accounting for 40.2% (95% CI: 36.6 – 43.7) of non-conformity, occurred in 52.7% (95% CI: 47.2 – 58.2) of prescriptions, while Type C errors, accounting for 37.6% of non-conformity (95% CI: 34.1 – 41.2), occurred in 70.3% (95% CI: 65.0 – 75.2) of prescriptions. Type D errors, 21.3% of non-conformity (95% CI: 18.5 – 24.4), were detected in 43.64% (95% CI: 38.2 – 49.2) of prescriptions (Table 2). Almost half (49.6%; 95%CI: 46.0 – 53.2) of all instances of non-conformity dealt with drug information and dispensing issues while the prescribing process (12.1%; 95%CI: 9.9 – 14.7) was the category with least number of instances of non-conformity (Table 1).

**DISCUSSION**
Compared with certain other studies,3,24,25 our rates of non-conformity were much lower, especially with regard to the generic names (28.9% vs. 84.9%), patient weight (14.9% vs. 100%), dose (3.6% vs. 44.4%), illegible handwriting (3.5% vs. 64.3%), and missing diagnosis (0.8% vs. 44%), according to the rates reported by Irshad et al.24 These findings are still rather surprising to most doctors in the practice since the pharmaceutical services in National Guard Health Affairs are very well managed and have in-built multiple levels of error control. In addition to providing clear guidelines to the clinicians, this control is achieved through a two-tiered system. Structurally, two copies of special
prescription sheets are available in each file; a copy is meant for the file and the other for the patient. This practice has proved effective in reducing prescription errors.26-28 A second level of control is through individual feedback by the pharmacists to the clinicians when the need arises. Systematic, targeted group feedback, and face to face interviews,29 have however, not yet been implemented. These measures, of course, are in addition to an intensive focus on continuing education for the different categories of care providers.

In view of all these organizational checks, such a high level of non-conformity to given guidelines may, in addition to knowledge, attitude and skill issues, be an indicator of excessive work load on the primary care providers. Root causes of this phenomenon should be explored through appropriately designed studies, and addressed accordingly. Although in the absence of such studies, the reasons of this non-conformity would remain a matter conjecture, different facets of the care provider’s cognitive framework certainly need to be looked into. Knowledge of pharmacology and therapeutics, attitude towards complying with guidelines, time and work load management skills, and communication with patients and colleagues are all potentially important areas to target, through individually tailored continuing medical education, management and leadership initiatives. Such measures on the local and organizational level requires consistent collaborative effort of the local physicians and pharmacists.

Alternative prescription paradigms have recently been suggested as a means of eliminating prescribing errors.30-37 These solutions, however, may not themselves be free of problems38,39 and may require considerable investment of resources. While such measures want to be adapted and introduced, solutions must be found for the single most important resource of all, the human resource, through simple effective and easily implemented modalities relating to the work place.

Non-discovery of prescription errors has been seen as a barrier to learning from experience, important for practice improvements,40 and the need for increased awareness, documentation, and the reporting of these errors has been identified as a priority.41 We therefore, suggest routine audits to detect and deal with prescription errors and non-conformity to guidelines in primary health care services.

Although education and on the job training are important for performance improvement in the process of prescribing,41 only such audits will ensure a process of collaborative learning in the team of care providers. Pharmacists can be trained to carry out these audits. Data automation can be used to deal with time constraints and maximize data validity, integrity, and confidentiality.

In addition to shaping the direction and focus of any efforts aimed at service improvement, such audits will provide an ongoing source of learning from the real situations in busy practice for all those involved in care. This will lead eventually, to positive changes in the culture of the workplace.

As improvements in the work environment, efficiency of relationships of different components of care,42 and proper feedback by pharmacists43 have all been shown to be effective tools for improving prescribing practices. It is hoped that by introducing such systems of ongoing audits, an inexpensive change can be effected.

CONCLUSIONS
With the prevalence of prescription errors in the National Guard Health Affairs primary care facilities, questions on the effectiveness of current control systems are raised. It is our view that regular audits of the implementation of guidelines should be incorporated in work routines, and feedback of results given to the care providers. Studies should be conducted to find out the underlying causes of the problem and assess the effectiveness of any interventional initiatives.

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