COMPUTER-AIDED PRESCRIBING: FROM UTOPIA TO REALITY

Objective. To determine whether the introduction of computer-aided prescribing helped reduce the administrative burden at primary care centers.

Design. Descriptive, cross-sectional design.

Setting. Torreblanca Health Center in the province of Seville, southern Spain. From 29 October 2003 to the present a pilot project involving nine pharmacies in the basic health zone served by this health center has been running to evaluate computer-aided prescribing (the Receta XXI project) with real patients.

Participantes. All patients on the center’s list of patients who came to the center for an administrative consultation to renew prescriptions for medications or supplies for long-term treatment.

Measures. Total number of administrative visits per patient for patients who came to the center to renew prescriptions for long-term treatment, as recorded by the Diraya system (Historia Clínica Digital del Ciudadano, or Citizen’s Digital Medical Record) during the period from February to July 2004. Total number of the same type of administrative visits recorded by the previous system (TASS) during the period from February to July 2003.

Main results. The mean number of administrative visits per month during the period from February to July 2003 was 160, compared to a mean number of 64 visits during the period from February to July 2004. The reduction in the number of visits for prescription renewal was 60%.

Conclusions. Introducing a system for computer-aided prescribing significantly reduced the number of administrative visits for prescription renewal for long-term treatment. This could help reduce the administrative burden considerably in primary care if the system were used in all centers.

Key words: Computer-aided prescribing. Administrative burden. Primary care. Computerization.

Palabras clave: Receta electrónica. Desburocratización consultas de AP. Informatización.
Introduction

Prescription renewal for long-term treatments is one of the main reasons for consulting in primary care. Against a background of the already large patient loads borne by primary care services, this motive has led to further increases in the numbers of visits to renew prescriptions for long-term treatment. Since reforms were undertaken in the public health system in Spain to improve primary care, several different models have been tested in an attempt to move these administrative consultations out of primary care centers, with the aim of improving demand management. Long-term treatment cards and other more recent strategies such as computerizing repeat prescriptions with authorized medication cards have been tried. Computer-assisted prescribing, although used thus far only in limited settings, has led to substantial progress in reducing medication errors by more than 60%, simply by ensuring that prescriptions are legible, complete and presented in a standardized format. However, these solutions share the same problem: a prescription is a public document with legal implications for the physician who signs it and for the pharmacist who fills it. The legal requirement for a physician’s signature obviates the possibility of delegating the function of prescribing. Moreover, follow-up vigilance and adjustments or changes in the prescribed medication along with supervision of adherence to treatment are not well supported by these models once the number of patients involved becomes large. Computer-aided prescribing offers a way around these problems by providing prescriptions valid for 6 months or 1 year, until the date of the next follow-up visit with the physician.

The present study was designed to determine the extent to which the introduction of a system for computer-aided prescribing helped reduce the administrative burden at primary care centers and thus freed resources for other health care actions.

Patients and Methods

The study was done at the Torreblanca Health Center (province of Seville, southern Spain), the first center in the region of Andalusia where computer-aided prescribing was piloted. This center serves an estimated population of 22,000 inhabitants of low sociocultural level, and the population contains large groups of marginalized persons living in two shanty towns. The population is relatively young, with persons younger than 14 years comprising almost 20% of the population, and the prevalence of toxic substance addiction and chronic diseases and disorders (e.g., diabetes, hypertension, mental illness, etc.) is high. In August 2003 the Citizen’s Digital Medical Record computerized medical records system was installed (under the project name Diraya) as a replacement for the previous computerized system (known as TASS). Computer-aided prescribing was included in the new system as part of the digital medical record.

General Scheme of the Study

Descriptive study of the frequency of attendance at the clinic for administrative reasons before and after introduction of electronic prescription.
When necessary for health-related reasons the pharmacist can withhold dispensation of specific products as a precautionary measure and inform the physician of this decision by completing a specially-designed on-line report form.

A pilot program has been in effect since 29 October 2003 at our health center to test computer-aided prescribing in the region of Andalusia (Receta XXI program) in actual patients. We took advantage of the fact that some physicians were already using a

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**FIGURE 1**

Computer-aided prescription form.

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### Compensation module

The physician can at any time modify or cancel any register in the patient's central dispensation module as needed; the patient is informed of such changes. The physician can also check the number of times the medications have been dispensed to the patient and thus track adherence to treatment.

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**Table: Prescription**

<table>
<thead>
<tr>
<th>User</th>
<th>Juan Suárez-Varela Úbeda, 1953, 600471052209</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prescriptions</strong></td>
<td><strong>Dosage</strong></td>
</tr>
<tr>
<td>Indicate the Product, if a Medication: INN or Brand, Pharmaceutical Form, Route of Administration, Doses per Package and Number of Packages</td>
<td>Units per Dose</td>
</tr>
<tr>
<td>1</td>
<td>AAD15210</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

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**Notes for Pharmacist** (As Needed)

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**Physician** (Identification)

Juan Suárez-Varela Úbeda

00006119383

**Physician’s Signature**

2170220004721541715

**Date of Prescription**

27/07/2004

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**Diagnostic Assessment** (If Appropriate)

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**Instructions for the User**

Not Valid If Changed or Corrected by Hand

This Prescription Is Valid Only Within the Autonomous Community of Andalusia

(Prescription Number)

213192355
**FIGURE 2**
Dispensation form of the computer-aided prescription form to be completed by the pharmacist.

<table>
<thead>
<tr>
<th>PHARMACY (Identification, Date of Dispensation, Signature)</th>
<th>PHARMACY (Identification, Date of Dispensation, Signature)</th>
<th>PHARMACY (Identification, Date of Dispensation, Signature)</th>
<th>PHARMACY (Identification, Date of Dispensation, Signature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Packages Dispensed of Each Product</td>
<td>Number of Packages Dispensed of Each Product</td>
<td>Number of Packages Dispensed of Each Product</td>
<td>Number of Packages Dispensed of Each Product</td>
</tr>
<tr>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

**NOTIFICATION OF THE USE BY THE PHARMACIST OF AN ADDITIONAL DISPENSATION FORM**
(Identification, Date and Signature)

THE ATTACHED DISPENSATION FORM THAT FOLLOWS THIS ONE IS IDENTIFIED WITH THIS PRESCRIPTION NUMBER AND THE APPROPRIATE SHEET NUMBER.

THE PHARMACIST IS LEGALLY AUTHORIZED TO SUBSTITUTE THE PRODUCT ONLY IN THE INITIAL DISPENSATION, AND ONLY IF THE MEDICATION IS NOT CLASSIFIED AS A LONG-TERM TREATMENT.
computer-aided system for repeat prescriptions provided through an administrative consultation to compare the number of visits for this motive during the period from February to July 2003 (previous system) with the number of visits for repeat prescriptions under the pilot program (new system) for the same period in 2004. Administrative consultations at the health center were scheduled weekly on Thursdays between 12.00 and 14.00 hours.

In this study we included all patients who were receiving long-term treatment, who had a long-term treatment card, who attended administrative consultations to renew their prescriptions, and who were included in the list of patients assigned to physicians who participated in the computer-aided prescription program. The number of weekly administrative consultations during 2003 was recorded from local TASS databases, and the number of weekly administrative consultations during 2004 was recorded from the central Diraya database. Data for these 2 periods were compared and the resulting descriptive statistics are reported below.

Results

Figure 3 shows the number of administrative visits to the health center recorded under the Diraya system from September 2003 to July 2004. Numbers are given for the start of computer-aided prescribing in clinical consultations for patients with chronic diseases or disorders for which care is offered at the center (a factor that led to a slight decrease in the number of administrative visits) and for the period when computer-aided prescribing was started in administrative consultations. The use of computer-aided prescribing for administrative consultations led to a substantial decrease in the number of visits starting in February 2004, and the decrease became steadily larger thereafter. In July 2004 the mean number of monthly visits for administrative consultation was 51, which reflected a 55% decrease in the mean number of monthly consultations from February-July 2003 to February-July 2004 (Figure 4). If we consider that approximately 3% to 5% of all administrative consultations were to pick up medical certificates of temporary incapacity for work and that these figures tend to remain stable, the decrease in the number of visits to renew prescriptions was greater than 60%.

The mean percentage of all prescriptions that were issued with the computer-aided system during the period from January to July 2004 was 13.24%; this figure represents a steady increase from 8.03% in January to 25.6% in June. Of these prescriptions, 68.4% were issued to pensioners and 31.16 to actively employed persons. The total number of packages dispensed was 1480, acquired by a total of 138 patients during this 6-month period. The packages dispensed comprised 528 valid prescriptions (i.e., 528 different products). Thus the mean number of different products consumed by each patient with a chronic disease or disorder was 3.83.

Of the total number of 616 prescriptions, 88 were canceled (14.29%) for the following reasons: medical order to suspend treatment in 51.14% of the cases; dispensation requested after the final date of treatment in 48.86% of the cases. The mean number of visits to pharmacies per month was 1.61, and the mean numbers of medications prescribed per therapeutic group are shown in Table.

Discussion

The introduction of computer-aided prescribing on 29 October 2003 during clinical consultations for patients receiving long-term care through the health center initially led to a small decrease in administrative consultations (Figure 3), as some patients who needed more than one medication were also followed in the latter. The mean number of visits per month decreased to 130 patients. After computer-aided prescribing was introduced on 15 January for all patients with chronic conditions who were seen in administrative consultations, the mean number of visits per month decreased rapidly and remained low. The mean number of visits per month fell to 72, and in July the mean number of visits per month was only 51 (Figure 3). This sustained decrease in the number of visits will make it possible to suspend the weekly administrative consultations in the short term and thus gain 2 hours per week for clinical consultations. Although this may appear to be a small gain, the long-term nature of care that characterizes primary care services means that we were able to see 4 patients with diabetes or benign prostatic hypertrophy each week at a rate of 30 minutes per consultation, so that by the end of the year it was foreseen that all patients served...
What Is Known About the Subject

- The current prescribing model increases the number of primary care consultations.
- Repeat prescriptions for chronic treatments generate a substantial administrative burden in primary care.
- Computer-aided prescribing reduces medication errors by more than 60% and ensures that the prescription is legible, complete, and standardized.

What This Study Contributes

- Computer-aided prescribing reduces the number of primary care consultations.
- Computer-aided prescribing helps reduce the administrative burden in primary care.

by our health center who were eligible for long-term care programs could be included in the appropriate program. For the period up to March 2004, the most frequent cause for cancellation of a computer-aided prescription was request for dispensation past the estimated last date of treatment. The grace period was initially set at 5 days before to 10 days after the estimated last day of treatment. As a result of this finding the end of the dispensation grace period was extended from 10 days to 2 months after the estimated end of treatment (the 5-day period before the end of treatment remained unchanged), as cancellation of one medication implied the cancellation of all other medications included in the same prescription (maximum of 5 per prescription). It was often the case that some medications in the prescription, such as analgesics or bronchodilators, are used as needed and the last day of treatment was sometimes later than that indicated in the prescription. Since then cancellations for this reason have been very rare.

The most frequent cause of medical order to suspend treatment was cancellation of the prescription during demonstrations of the system to visiting groups of physicians and pharmacists from other regions of Spain (Catalunya and Navarre) and other countries (Sweden, France, and Argentina).

We consider the mean number of visits per month to pharmacies (1.61) to be too high. This result may be related with the fact that the number of packages of each product that can be acquired per visit is limited to one, so that users need to return to the pharmacy when the product with the smallest number of doses per package runs out.

This problem demotivates some users, since under the previous system more than one package of the medication likely to run out soonest could be acquired at once; the number of packages dispensed was calculated on the basis of the medication that would last the longest. To avoid this problem a similar approach to multiple dispensations is being considered for the Receta XXI program.

The most heavily used therapeutic groups were those for the most prevalent chronic diseases (Table 1). The low rates of prescription for test strips and incontinence pads under this system reflected the fact that these products require administrative authorization, and there were initially problems with electronic authorization in the new system.

To date a satisfactory mechanism has yet to be developed for computer-aided prescription renewal, necessitating the issue of a new prescription when the previous one has been dispensed in its entirety.

A search of the literature identified only one article that analyzed the characteristics and safety of prescription issued by family physicians with computer-aided systems; however, this study did not involve actual patients but was based on dummy patient records.

At a seminar organized by the European Health Telematics Association in Amsterdam in June 2004, specific strategies for computer-aided prescribing were examined and the extent of implementation in different countries in Europe was compared. The countries where most progress has been made were Denmark, with 70% of all prescriptions issued electronically, and Sweden, where this figure was 27%. The situation in England was similar to that in Spain, as both countries have piloted systems for computer-aided prescribing but have not yet implemented this tool on a wide scale. The rest of the countries in Europe are still in the very early stages of development of similar systems.

Because the available data are preliminary, we have evaluated here only the improvements attained with compu-
Computer-Aided Prescribing in Spain

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With the spread of informatics within the health system in Spain, it was to be expected that health service managers would decide to change the prescription, dispensation and payment system. The current system, with the exception of mechanical aspects such as the incorporation of bar codes and self-copying paper for prescriptions, is rather antiquated and has changed little in structural terms since the implementation of official Social Security prescription forms.

For many years this has remained the only system in operation for the process of prescription, dispensation and payment, and has undergone no substantial modifications since its inception. Before the primary care system was reformed, long lines formed at social security outpatient centers to obtain prescriptions. Reforms in primary care were accompanied by greater attention to chronic conditions; this led to the medicalization of chronic processes, and this in turn, along with other cultural and health care-
related factors, led once again to crowding, long waits and inefficiency at primary care centers. In recent years there have been several attempts (varying in organizational level and scope) to decrease the patients’ need to visit the health center to obtain official prescriptions for long-term medication, and to attempt to reduce the administrative burden on health centers. Health centers have made a number of attempts to reduce bureaucracy, and systems have been created to favor a more rational use of consultations. Some of these measures have been the creation of a long-term medication card and the establishment of parallel consultations staffed by nursing or administrative personnel—a measure that requires additional human and technical resources. Local projects have been tested with software to detect drug interactions as well as much as 60%, but computers can help in other important ways by flagging known contraindications, which account for up to 4% of all severe adverse reactions, and by avoiding known allergies and active ingredient duplication.

Prescribing physicians in Spain have rather reluctantly agreed that there is a need to use computer-based resources to modernize two basic tools of our trade: medical records and prescriptions. However, the computerization of medical records has not been without its problems (e.g., slow communications systems, complex medical histories, software incompatibilities, and disconnect between levels of care and professional training, among other obstacles). Computer-aided prescribing adds new problems that need to be dealt with to allow the process to spread so that pilot testing can take place in other settings: Will it be necessary to obtain the patient’s informed consent? Will personal information regarding diagnoses be involved? Will there be advantages in terms of patient’s safety (allergies, interactions, contraindications, active ingredient duplication)? Will the digital signature system be sufficiently secure? Will the system be easy for all users? Will the system for modifying prescriptions be agile? Will it prevent current multiple dispensations at pharmacies? Will it prevent the current indiscriminate substitution at pharmacies of generics for both acute and long-term treatments? Will it prevent the stockpiling of medications at home? Will it stop other specialists from issuing long-term prescriptions without consulting the family physician?

Regarding the first 2 questions, the National Association of Health Service Users and Consumers (Asusalud) has raised objections with respect to the need to obtain the patient’s informed consent for treatment and the possible transmission of information this might imply. This health users’ association fears that information about patients might be used inappropriately because there is as yet no provision for data protection.

Regarding the patients’ physical safety, the benefits the system is expected to offer are essential because medication errors are preventable errors. This is not an easy undertaking, and in the United Kingdom, where the use of computer-aided processes by general practitioners is more widespread than in Spain, it has been found that some programs were unable to detect prescribing errors.

Aside from issues of safety, the processes most in need of improvement are essentially prescribing by the physician
and compliance by the patient. Reducing the number of unnecessary consultations will benefit both.

A newer problem is the indiscriminate substitution of generic drugs—even those used for long-term treatments—at the pharmacy. We do not know who substitution benefits, as this practice serves only to confuse the patient. We hope that computer-aided prescribing will make current practices more rational and help to bring data on dispensing practices into the open. Another (older) problem is posed by prescriptions issued by other specialists and that must be renewed by the family physician. These induced prescriptions are not approved or accepted by the primary care physicians, and are known to be one of the routes through which new medications are introduced in practice. We hope that the new computer-aided prescribing system will make it possible to identify the physician who issues prescriptions for indications that have not been considered and approved by the family physician.

Computer-aided prescribing will probably improve administrative processes, provide billing and payment information in real time, and avoid delays (which can be as long as 2 months) in updating the information held in the present system.

To conclude, it is our understanding that a process of this scope, involving almost all actors in health care, should be designed on the basis of meticulous planning with a view to the actual benefits for all parties involved. The new prescribing system should thus aim to deal with current problems while avoiding the creation of new ones.

References