

Computer-Aided Prescribing: From Utopia to Reality

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Objetivo. Valorar si la introducción de la receta electrónica ayuda a desburocratizar las consultas de atención primaria.

Diseño. Estudio descriptivo, transversal.

Emplazamiento. Centro de Salud de Torreblanca, donde desde el 29 de octubre de 2003 se está pilotando, junto con las 9 oficinas de farmacia de la Zona Básica de Salud, la implantación de la Receta Electrónica de Andalucía (Receta XXI) con pacientes reales.

Participantes. Todos los pacientes de un cupo médico que acuden a consulta administrativa para la renovación de tratamientos crónicos entre febrero y junio de 2004.

Mediciones. Número total de consultas administrativas realizadas por todos los pacientes que acuden para la renovación de tratamientos crónicos registrados mediante el sistema operativo DIRAYA (Historia Clínica Digital del Ciudadano) y comparación con el mismo tipo de consulta administrativa registrado en TASS en el período comprendido entre febrero y julio de 2003.

Resultados principales. La media mensual de consultas administrativas entre febrero y julio de 2003 fue de 160, frente a las 64 habidas entre febrero y julio de 2004, lo que supone una reducción de la frecuentación para la renovación de recetas del 60%.

Conclusiones. La introducción de la receta electrónica reduce significativamente la frecuentación de consultas administrativas para la renovación de recetas de tratamientos crónicos, lo que ayudará a desburocratizar de forma importante las consultas de atención primaria cuando se generalice su uso.

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

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.

Participants. 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.

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Introduction

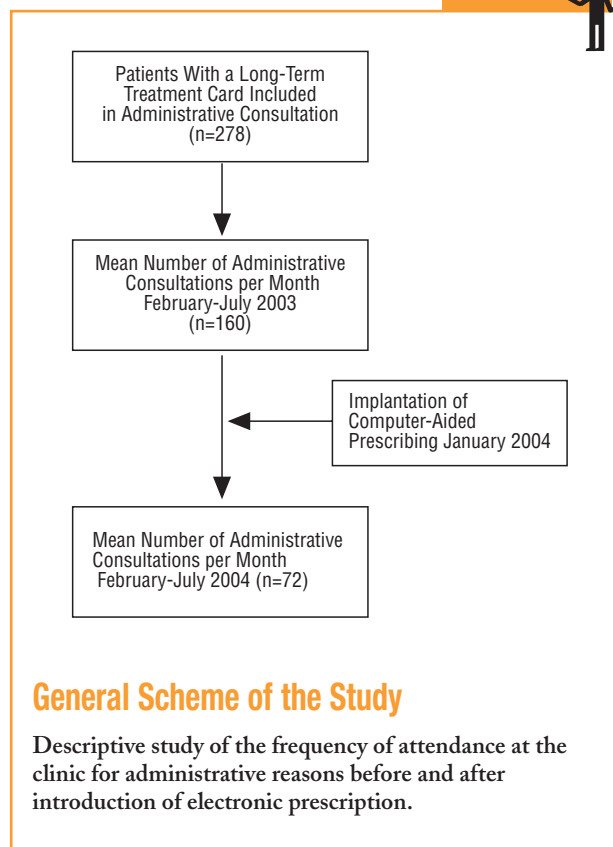
Prescription renewal for long-term treatments is one of the main reasons for consulting in primary care.^{1,2} Against a background of the already large patient loads borne by primary care services, this motive has led to further increases in the numbers of visits to renew prescriptions for long-term 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^{3,4} and other more recent strategies such as computerizing repeat prescriptions with authorized medication cards^{5,6} 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.^{7,8}

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.⁹ 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.

Material and methods



The Diraya system allows health care professionals access to a database for the region of Andalusia maintained in Seville (where the administrative offices of the regional health system are located). The database contains information on all users of the public health care system in the region. The key for accessing computer-aided prescription operations is the patient's health card, a document issued to each individual user and bearing the user's personal code number. This number serves to confirm that the patient is a legitimate user of the public health system and indicates the type of pharmaceutical service the user has access to.

When the physician issues a computer-aided prescription the information is recorded in the patient's dispensation module along with the patient's current "pharmaceutical credit," which indicates the full treatment prescribed by the family physician.

All prescriptions issued at that time are printed out on the revised official prescription form (Figure 1). The physician indicates dosage and duration of treatment, and can add further instructions for the patient as needed. The prescription form is kept by the patient and is presented each time the prescription is filled by the pharmacist until it expires (after a maximum period of 1 year). The pharmacist notes the required dispensation information on the second page of the form each time a prescription is filled (Figure 2).

Prescriptions can be filled at any pharmacy in the basic health zone where the patient resides that is operated by a pharmacist accredited with the regional health service. Patients must show their public health system ID card to the pharmacist, who uses the number on the card to gain access on line to the central dis-

Prescription

Andalusian Health Service
Health Council

COMMON ILLNESS OR NON-WORK RELATED ACCIDENT

User (First Name, Surnames, Year of Birth, Identification Number)
 Juan Suárez-Varela Úbeda, 1953, 600471052209

PRESCRIPTIONS			DOSAGE		Duration of Treatment, Days	Estimated Last Date of Treatment
Indicate the Product, if a Medication: INN or Brand, Pharmaceutical Form, Route of Administration, Doses per Package and Number of Packages			Units per Dose	Period Between Doses		
1	AAD15210	553926 Paracetamol 1 g, 8 Tablets, Effervescent	1	6 Hours	2	29/07/2004
2						
3						
4						
5						

Notes for Pharmacist (As Needed)

Physician (Identification)

 Juan Suárez-Varela Úbeda
 00006119383

Physician's Signature

 2170220004721541715

Date of Prescription

 27/07/2004

Diagnostic Assessment (If Appropriate)

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 1

Computer-aided prescription form.

pensation module, where the medication prescribed and patient's type of coverage for the cost of prescriptions (employed, retired, other) is shown.

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.

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

DISPENSATION FORM NO..... FOR PRESCRIPTION NO.213192355

PHARMACY (Identification, Date of Dispensation, Signature)					PHARMACY (Identification, Date of Dispensation, Signature)					PHARMACY (Identification, Date of Dispensation, Signature)					PHARMACY (Identification, Date of Dispensation, Signature)				
Number of Packages Dispensed of Each Product					Number of Packages Dispensed of Each Product					Number of Packages Dispensed of Each Product					Number of Packages Dispensed of Each Product				
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>					The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>					The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>					The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>				

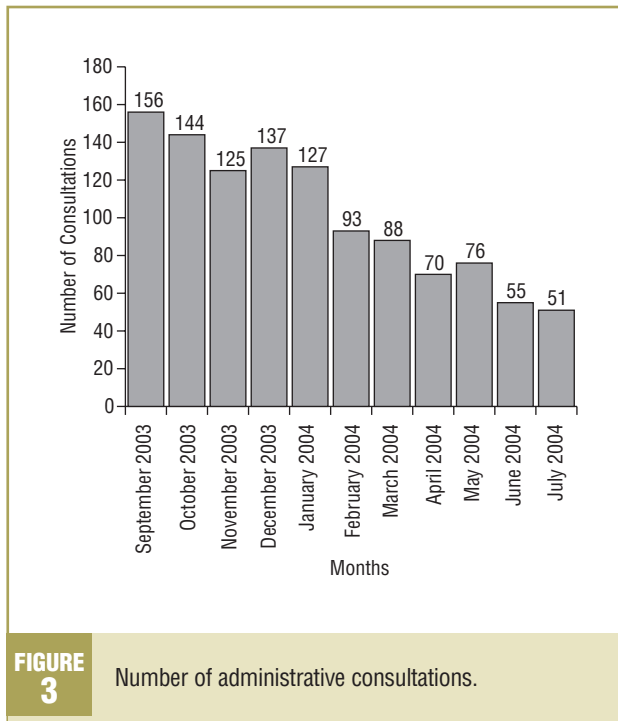
PHARMACY (Identification, Date of Dispensation, Signature)					PHARMACY (Identification, Date of Dispensation, Signature)					PHARMACY (Identification, Date of Dispensation, Signature)					PHARMACY (Identification, Date of Dispensation, Signature)				
Number of Packages Dispensed of Each Product					Number of Packages Dispensed of Each Product					Number of Packages Dispensed of Each Product					Number of Packages Dispensed of Each Product				
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>					The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>					The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>					The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>				

PHARMACY (Identification, Date of Dispensation, Signature)					PHARMACY (Identification, Date of Dispensation, Signature)					PHARMACY (Identification, Date of Dispensation, Signature)					NOTIFICATION OF THE USE BY THE PHARMACIST OF AN ADDITIONAL DISPENSATION FORM (Identification, Date and Signature)				
Number of Packages Dispensed of Each Product					Number of Packages Dispensed of Each Product					Number of Packages Dispensed of Each Product									
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5					
The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>					The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>					The Product Indicated Below Was Dispensed in Place of Product No. <input type="checkbox"/>					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.

FIGURE 2

Dispensation form of the computer-aided prescription form to be completed by the pharmacist.



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 Fe-

bruary 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

Discussion
Key points

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.

TABLE 1
Medication Prescribed

Type of Medication or Product	Prescriptions	Percentage
Antihypertensives	126	24.00
Antiacids and antiulcer medication	55	10.48
Insulin and oral antidiabetics	51	9.71
Neuroleptics, tranquilizers and antidepressants	50	9.52
Oral antiaggregants and anticoagulants	29	5.52
Antiinflammatory and antirheumatic medication	29	5.52
Lipid-lowering medication	28	5.33
Analgesics	26	4.95
Bronchodilators and corticosteroids	26	4.95
Test strips and incontinence pads	8	1.52
Other	97	18.48

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 article¹⁰ 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 Telemedicine Association in Amsterdam in June 2004, specific strategies for computer-aided prescribing were examined¹¹ 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-

ter-aided prescribing with regard to a problem particular to the primary care setting: the patients' need to renew prescriptions for long-term treatments and the resulting excess demands on the family physician's time. Aside from this problem, however, the current prescription and dispensation model has other failings such as dispensation errors, dosage errors, heavy administrative burden to ensure correct payment at the pharmacy, and difficulties in generating a database of medications that might be used to analyze prescriptions. In developed countries one person dies every hour because of a medication-related problem (error, contraindication, self-underdosage, interactions or side effects).¹² A computer-aided prescribing system would help reduce these problems by making it possible to issue alerts for contraindications and interactions, and by improving the tracking and monitoring of treatments.¹⁰

For these reasons the introduction of computer-aided prescribing should be a priority action in public health systems, and should become an important criterion for improving the quality of health care.

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COMMENTARY

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-

Key Points

- The current system for prescription, dispensation, and payment is antiquated and its basic structure has remained unchanged since the appearance of the official Social Security prescription forms.
- Any program aimed at substantially modifying the current model will need additional economic resources.
- Completing the computerization process at health centers and pharmacies that are not yet fully computerized should be seen as a necessary element in the modernization of the health system regardless of the prescription, dispensation, and payment system.
- The process of change should be meticulously planned with a view to the real benefits for all parties involved, to solving current problems, and to avoiding the creation of new ones.

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.¹ Health centers have made a number of attempts to reduce bureaucracy, and systems have been created to favor a more rational use of consultations.² Some of these measures have been the creation of a long-term medication card and the establishment of parallel consultancies 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 associated with long-term treatment cards or authorized medications.³

The article by Suárez-Varela et al published in this issue of *ATENCIÓN PRIMARIA* describes the results 6 months after the implantation of computer-aided prescribing at a health center in Andalusia (southern Spain). Computer-aided prescribing reduced by 60% the mean number of administrative consultations to obtain prescriptions for long-term treatments. The authors evaluate one of the first pilot studies of computer-aided prescribing in Spain, and the study has since been replicated in other regions (Andalusia, Valencia, and Galicia). The process was begun when Parliament approved the introduction of computer-aided prescribing through an Accompanying Law passed in December 2003.⁴ The authors subtitled their article "From Utopia to Reality" as a reflection and summary of the expectations this development has generated, and the

substantial change it implies. However, from the viewpoint of the prescribing physician, certain issues need to be clarified for a program of this type to be successful.

In principle, the process will need additional economic resources, but computerizing the health centers and pharmacies that are not yet fully computerized should be seen as a necessary part of modernizing the health system.

Mechanization of the prescription process, simply by eliminating handwriting, can reduce prescription errors by as much as 60%,⁵ 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.⁶

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.

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