Modifying Provider Behavior

A Low-tech Approach to Pharmaceutical Ordering

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OBJECTIVE: To determine if a clinically structured, paper-based prescription form can modify pharmaceutical prescribing behavior without restricting physician freedom to select the most appropriate medication for an individual patient.

DESIGN: Uncontrolled, nonrandomized, time series design.

SETTING: The urgent care clinic of a university-affiliated, county-supported hospital that provides care for underserved, vulnerable populations.

PATIENTS: Patients ($N = 2,189$) who had a prescription written at the intervention site during the study.

INTERVENTION: Four-phase interventions lasting 2 weeks each, with a washout period between each phase, consisting of: (1) collection of baseline data utilizing the traditional prescription blank, (2) introduction of the pre-formatted prescription form, (3) use of the pre-formatted prescription form with medication cost added, and (4) pre-formatted prescription form with target drug (ranitidine) removed.

MEASUREMENTS AND MAIN RESULTS: Physicians were less likely to prescribe ranitidine compared to cimetidine after the introduction of the cost information ($P < .01$) and again after the removal of ranitidine from the pre-formatted prescription form ($P < .001$).

CONCLUSIONS: A structured, paper-based prescription order form can shift prescribing practices without inhibiting physicians' ordering freedom.

KEY WORDS: structured prescription forms; provider behavior modification; pharmaceutical cost.

J GEN INTERN MED 2002;17:792-796.

The need to reduce health care costs has become the mantra of government, private industry, and large health care delivery systems. Pharmaceutical spending

exceeded \$62 billion in 1996¹ and is among the most rapidly increasing components of health care expenditures.² Physicians control the vast majority of these expenditures. Various strategies, such as evidence-based academic detailing and other multidisciplinary approaches, have been used to change physician prescribing behavior.³ Most often, cost reduction efforts have been accomplished through external reviews⁴⁻⁶ and controls placed upon physicians.⁷⁻⁹ For some, this review process and loss of professional autonomy has resulted in a less than satisfactory relationship between provider, health plan, and patient; including ethical pressure on physicians.^{10,11}

There are successful efforts to improve the quality of patient care while reducing costs that utilize automated decision support systems.^{12,13} Unfortunately, such systems have a limited number of installations. We anticipate that the long-term solution to optimal prescribing practice will be a comprehensive computer management system. However, our operational reality today dictates the development of low-cost solutions that are rapidly implementable, affect individual physician decisions at the point of care, and achieve cost savings without detriment to patient care.

METHODS

Setting

The intervention site was the Medical Walk-In (MWI) urgent care clinic at a 377-bed university-affiliated, county-supported, indigent care teaching hospital in Southern California. Staffing consists of a combination of 51 physicians, including full- and part-time staff, medical house staff, and students. The clinic operates from 8:00 AM to midnight, Monday through Friday, with 20,300 visits annually. Sixty-three percent of patients seen receive a prescription. Of patients who receive a prescription, the average number of prescriptions given in a single visit is 1.8.

Study Design

The study was an uncontrolled, non-randomized, time series design consisting of four 2-week phases separated by washout periods. Data were collected on all prescriptions during the study periods. The first phase collected baseline data on the pharmaceutical ordering practice in the clinic, utilizing a traditional unstructured prescription blank. The second phase introduced the structured pre-formatted prescription form containing 18 high-volume medications, including 2 H₂ blockers (ranitidine and cimetidine) with

Received from the Departments of Medicine (JJG, BAC, PGG) and Emergency Medicine (JJG), University of California-Los Angeles, Los Angeles, Calif; the Department of Ambulatory and Community Medicine (JJG, BAC, PGG), Olive View-UCLA Medical Center, Sylmar, Calif; Foundation Health Plan (BAC), Woodland Hills, Calif; University of California-Los Angeles School of Medicine (BM), Los Angeles, Calif; and Los Angeles County Department of Health Services (JJG, PGG, DT, SGG-S), Los Angeles, Calif.

[†]Posthumous.

Presented in part at the annual sessions of the Society of General Internal Medicine, Chicago, Ill, April 25, 1998.

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their unit of use, and 3 blank spaces to allow physician prescribing freedom. The third phase identified the cost of each medication (acquisition cost plus fill fee) on the structured prescription form (Fig. 1). In the fourth phase we removed ranitidine, the more expensive of 2 pre-formatted H₂ blockers. Physicians could still choose to hand write prescriptions for ranitidine without formulary restriction. Data were compiled from each prescription form, the pharmacy database, and medical records. The data elements captured included: visit date, patient identifier, provider, medication name, dose, form, quantity, cost, and prescription-writing method.

Development and Implementation of the Test Instrument

To develop the form, we selected the most commonly prescribed and important medications used in MWI. It was developed in conjunction with the full-time faculty, who were clinical managers in the MWI clinic, and by accessing pharmaceutical data from the pharmacy database. Each form was a standard 8¹/₂" × 11" sheet and contained 18 pre-formatted medications from 10 therapeutic categories. The form was developed with the goal that most patients would be able to have all of their prescriptions written on a single form. We anticipated that the pre-formatted *unit of use* prescriptions would cover a significant proportion of the Medical Walk-In needs. The 3 prescription blanks at the bottom of the form allowed physicians to freely prescribe medications of their choice if the preferred medications were not included in the pre-formatted list. The physicians were allowed to order up to 8 medications per form, including the 3 handwritten ones.

An in-service training program was given to the clinical managers as part of routine faculty meetings before implementation in Phase 2. The full-time faculty then taught other providers. No further in-service was offered on form usage in the subsequent phases. At the end of each study phase, there was a washout period. During this time, all prescription instruments were collected and removed from the clinical area and the next phase form was substituted. Clinicians then used the new tool for several weeks before data collection began. There were no formulary changes in the study drug classes during the study period.

Data Collection and Analysis

The unstructured prescription blank as well as the structured prescription forms were printed utilizing 3-part NCR paper. Each prescription copy was placed in a data collection bin, and raw data from the prescriptions were entered into a computer database designed specifically for this project. As a cross check, and when necessary because of illegibility, the dispensing records from the pharmacy and manual chart review were utilized to ensure accurate and complete raw data abstraction.

In addition to maintaining the drug name as it was written in the original prescription (specific trade name or generic), the generic equivalent of each prescription was generated using a translation table. Data manipulation and transformation were accomplished utilizing the Clipper database system Version 5.2d (Computer Associates, Islandia, NY).

Pearson χ^2 statistics were conducted to determine the differences in cimetidine and ranitidine prescribing patterns between all 4 phases. A 2-sample test of equality of proportions was used to determine the change in unique prescriptions among all drug classes across the 4 phases. All statistical analyses were performed using SAS 8.1 (SAS, 2001. SAS Institute Inc., Cary, NC).

There was no outside sponsorship of this study, and no conflict of interest existed. We had full access to all study data and accept full responsibility for the integrity of the data and the accuracy of the data analysis. The use of pre-formatted clinically specific forms was initiated as a medical administrative decision. The study underwent review for aggregation and publication of resultant data and was approved via expedited review by the Human Subject Protection Committee Chair.

RESULTS

Prescriptions ($N = 4,202$) (172 for H₂ blockers and 8 for proton pump inhibitors, [PPIs]) were written during the four 2-week study periods (1,030, 1,166, 1,075, 931 respectively) for 2,189 patients (168 of whom received a prescription for a secretory acid reducer).

There was no change in the target outcome, a reduction in the use of the more-expensive H₂ blocker (ranitidine), versus the use of the less expensive H₂ blocker (cimetidine), from the unstructured (Phase 1) to the structured prescription form (Phase 2) (48% vs 49%; $P = .978$). The introduction of cost information (Phase 3) and the subsequent requirement of hand-writing the prescription rather than checking a pre-formatted prescription (Phase 4) reduced the use of ranitidine dramatically to 21% ($P < .0066$) and 0% ($P < .0007$), respectively, of all secretory acid reducers. There was no shift to PPIs, a more expensive class of acid reducer, over the course of the study period (6.3%, 5.4%, 4.2%, 2.1%).

The proportion of unique prescriptions across all drug classes (any difference in generic medication name, dose, form, or duration of therapy) decreased significantly between Phase 1 (64%) and Phase 4 (52%), ($P < .0001$). This finding and its ramifications will be investigated further. Results are summarized in Table 1.

DISCUSSION

While therapeutic substitution has had success in reducing pharmaceutical costs,^{14,15} the process is an anathema to many physicians. Our intervention was

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Rx Amoxicillin # 30 \$6.35 500 mg po tid x 10 days () _____ Refills _____ initial	Rx Amox-Clav (Augmentin) # 30 \$71.45 500 mg po tid x 10 days () _____ Refills _____ initial	Rx Benazepril (Lotensin) # 60 \$26.30 5 mg po qd x 2 months () _____ Refills _____ initial
Rx Benzonatate (Tessalon Perles) # 30 \$8.25 100 mg po qid prn cough x 7 days () _____ Refills _____ initial	Rx Cephalexin (Keflex) # 40 \$8.75 500 mg po qid x 10 days () _____ Refills _____ initial	Rx Cimetidine (Tagament) # 100 \$23.75 400 mg po bid () _____ Refills _____ initial
Rx Doxycycline # 28 \$5.65 100 mg po bid x 14 days () _____ Refills _____ initial	Rx Erythromycin # 40 \$8.50 500 mg po qid x 10 days () _____ Refills _____ initial	Rx Conj. Estrogen (Premarin) # 100 \$28.40 0.625 mg po qd () _____ Refills _____ initial
Rx Glipizide (Glucotrol) # 100 \$14.50 5 mg po qd () _____ Refills _____ initial	Rx Glipizide (Glucotrol) # 100 \$22.45 10 mg po bid () _____ Refills _____ initial	Rx Glyburide (Micronase) # 100 \$13.65 5 mg po qd () _____ Refills _____ initial
Rx Ibuprofen (Motrin) # 100 \$6.10 400 mg po tid prn pain () _____ Refills _____ initial	Rx Metronidazole (Flagyl) # 14 \$4.60 500 mg po bid x 7 days () _____ Refills _____ initial	Rx Pirbuterol (Maxair) 2 inhalers \$41.15 2 puffs qid () _____ Refills _____ initial
Rx Progesterone (Provera) # 100 \$18.50 2.5 mg po qd () _____ Refills _____ initial	Rx Pseudoephedrine (Sudafed) # 30 \$4.50 60 mg po qid x 7 days () _____ Refills _____ initial	Rx Ranitidine (Zantac) # 120 \$172.50 150 mg po bid () _____ Refills _____ initial
Rx Salsalate (Disalcid) # 100 \$8.20 750 mg po tid x 1 month () _____ Refills _____ initial	Rx Triamcinolone 0.1% cream (Kenalog) # 45 grams \$5.75 apply cream bid () _____ Refills _____ initial	Rx TMP/SMZ DS (Bactrim DS) # 14 \$4.80 1 tablet po bid x 7 days () _____ Refills _____ initial
Rx # _____ sig: _____ () _____ Refills _____ initial	Rx # _____ sig: _____ () _____ Refills _____ initial	Rx # _____ sig: _____ () _____ Refills _____ initial

Total number of prescriptions: ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

____ / ____ / 96 Signature _____ M.D.

CALIF. LIC # _____ DEA # _____ PRINTED NAME _____

PRESCRIPTION ORDER FORM

PATIENT DATA-IMPRINT OR PRINT LEGIBLY

Name
MRUN
Date of Birth
Ward or Clinic
Req. Loc. Clinic

☐ I
☐ C

FIGURE 1. Pre-formatted structured prescription form with cost information.

structured with the following philosophical framework: *If you make the right choice the easy choice, then getting physicians to do the right thing is easy*SM. Many physicians are unaware of the cost differential between similar medications. Like Roth et al.,¹⁶ we found that increasing

physician awareness of medication cost led to a voluntary reduction in the use of more-expensive pharmaceuticals. We targeted cimetidine and ranitidine, since they are nearly therapeutically interchangeable but have a large cost base difference.⁸ The annualized direct cost savings of moving

Table 1. Study Phase by Outcome Measures

Phase	Description	Patients in Group, <i>n</i>	Unique Prescriptions, % (<i>n</i> unique/ <i>n</i> total)	Cimetidine, % (<i>n</i> = cimetidine/ total <i>n</i> acid reducers)	Ranitidine, % (<i>n</i> = ranitidine/ total <i>n</i> acid reducers)	Other H ₂ Blockers, % (<i>n</i> = other H ₂ blockers/total <i>n</i> acid reducers)	PPIs, % (<i>n</i> = PPIs/ total <i>n</i> acid reducers)
I	Standard prescription blank	867	64 (657/1,030)	46 (22/48)	48 (23/48)	0 (0/48)	6 (3/48)
II	Structured form	966	55 (641/1,166)	46 (17/37)	49 (18/37)	0 (0/37)	5 (2/37)
III	Structured form +	872	55 (595/1,075)	73 (35/48)	21 (10/48)	2 (1/48)	4 (2/48)
IV	Cost information Structured form + Cost information + Ranitidine removed from pre-formatted list	790	52 (483/931)	98 (46/47)	0 (0/47)	0 (0/47)	2 (1/47)

market share between cimetidine and ranitidine for this single clinic was greater than \$50,000.

For optimal prescribing, physicians must blend awareness of medication cost with selection of the most clinically effective medications. In our design it is possible to see the independent motivating effect of price awareness as compared with the removal of a pre-formatted prescription option. We can generalize these findings only to other situations in which agents with cost differences can be effectively substituted without negatively affecting quality of care.

This technique had a profound effect on targeted pharmaceutical ordering behavior without loss of physician autonomy. The form was designed to both improve efficiency of writing prescriptions and reduce medication error by improving legibility. Use of this pre-formatted form reduced the number of unique prescriptions by 19% and shifted 25% of the prescriptions from traditional longhand to a simple checkbox.

An essential component to changing provider behavior is incorporation of an acceptable "escape clause" that allows physicians the freedom to prescribe non-pre-formatted medications when they deem it medically necessary.¹⁵ Physician feedback about use of the form was generally positive. It resulted in significant behavior modification by providing the required information at the point of prescribing rather than by erecting administrative barriers to care. We are investigating options to improve the efficiency of the pre-formatted form.

This study was uncontrolled; however, the time series design increased our confidence in the validity of the changes observed. At the time of the study, there were no other drug studies or clinical or administrative interventions involving these 2 medications. Our paper-based approach is limited by: the recurring expense of updating the forms whenever costs or formulary changes occur; the ability to target only a limited number of medications; and

paper storage logistics. Nevertheless, until e-prescribing solutions are an operational reality, we have an easily implementable solution.

At the time of the study, the form was not generalizable for community-based use outside of a closed hospital environment. Earlier attempts at cost control by other organizations led to designs of multiple check-off forms that restricted physician prescribing freedom. In response, the California Board of Pharmacy instituted regulations that prohibited the use of multiple check-off prescription pads. This study demonstrated that use of a highly structured form, combined with unique characteristics that ensured that patient safety and physician autonomy could be maintained, was not only feasible but also desirable. As a result, California law has recently been changed to allow preprinted, multiple check-off prescription forms that include our design features.¹⁷

Implementation of this intervention in a closed system with employed physicians is clearly easier than in a private practice environment. We recognize that the 8 1/2" × 11" paper size presents logistical difficulties for both physicians and pharmacists. In our second-generation design, currently under study, the form is smaller, allowing for a single fold to fit in a standard pharmacist prescription filing box or lab coat pocket. The ideal paper-based form will be generated at the point of care. The patient-specific form will be constructed electronically from data elements that include a patient's current medications, allergies, pharmaceutical benefit, and formulary design, such that the most appropriate medication in each drug class is pre-formatted.

CONCLUSION

A paper-based, clinically structured pharmaceutical order form, customized for a specific care setting, can provide significant enhancement of physician prescribing

practices. We demonstrated the ability to shift to a more cost-effective, therapeutically equivalent medication within a single drug class and to reduce variability across pharmaceutical prescribing without imposing restrictions on prescribing freedom. While we believe that an electronic decision support system may provide a superior long-term solution, our intervention is implementable quickly, without large capital investment. Further work beyond the outpatient urgent care setting is required to confirm our initial positive results.

We would like to acknowledge Wayland Chan, PharmD for his assistance in acquiring pharmacy records. We also thank Natalia Bilan for her assistance in data entry.

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