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Health Information Technology and Physicians' Knowledge of Drug Costs

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The United States is preparing to invest billions of dollars in a major reform of its healthcare system.¹ A critical step is increasing the use of health information technology (IT).^{1,2} Although prior studies have focused on the ability of IT to make *clinical* information (eg, medical history, labs) available at the point of care,^{3,4} IT systems also can be designed to facilitate physicians' and patients' access to accurate and timely cost information.^{5,6} This access is especially important as policymakers, insurers, physicians, and patients alike grow increasingly concerned with containing healthcare costs.^{1,7}

In this study, we examined the association between physicians' use of IT and their knowledge of drug costs. Nationally, 26% of patients report nonadherence to medications because of cost.⁷ Although physicians want to help, they often are hampered by their lack of awareness of drug costs.^{5,8,9} Health IT can improve physicians' access to cost information. A 2003 survey found that computerized prescription order entry was associated with physicians having greater knowledge of drug costs,⁵ but since then information regarding formularies, copayments, and retail prices has increasingly become available via other forms of IT such as the Internet and personal digital assistants (PDAs)¹⁰ (see www.epocrates.com, www.uptodate.com, www.medicalletter.com, www.medicare.gov, www.drugstore.com, www.costco.com, and www.walmart.com). Understanding whether different types of IT are currently associated with better knowledge of drug costs can highlight if physicians are already successfully obtaining cost information using health IT, or if further improvements in IT design are needed.

Objective: To examine whether physicians' use of information technology (IT) was associated with better knowledge of drug costs.

Study Design/Methods: A 2007 statewide survey of 247 primary care physicians in Hawaii regarding IT use and self-reported knowledge of formularies, copayments, and retail prices.

Results: Approximately 8 in 10 physicians regularly used IT in clinical care: 60% Internet, 54% e-prescribing, 43% electronic health records (EHRs), and 37% personal digital assistants (PDAs). However, fewer than 1 in 5 often knew drug costs when prescribing, and more than 90% said lack of knowledge of formularies and copayments remained a barrier to considering drug costs for patients. In multivariate analyses adjusting for sex, practice size, years in practice, number of formularies, and use of clinical resources (eg, pharmacists), use of the Internet—but not e-prescribing, EHRs, or PDAs—was associated with physicians reporting slightly better knowledge of copayments (adjusted predicted percentage of 23% vs 11%; $P = .04$). No type of IT was associated with better knowledge of formularies or retail prices.

Conclusions: Despite high rates of IT use, there was only a modest association between physicians' use of IT and better knowledge of drug costs. Future investments in health IT should consider how IT design can be improved to make it easier for physicians to access cost information at the point of care.

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METHODS

Study Design and Subjects

The study was a 2007 cross-sectional survey of community physicians in Hawaii who provided adult primary care, regularly saw patients, and were likely to face more than 1 formulary in their clinical practice. We initially identified 819 general internists, family physicians, and general practitioners through the Hawaii Medical Association (which records all licensed Hawaii physicians) and local health plans' lists of participating physicians. We called physicians' offices to exclude specialists, Kaiser and military physicians (ie, those employed by staff model institutions with a single formulary),

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Take-Away Points

In this statewide survey, high rates of health information technology use by physicians were only modestly associated with better knowledge of drug costs.

- Approximately 8 in 10 physicians regularly used health information technology in clinical care; however, only 1 in 4 often knew drug costs.
- In multivariate analyses, Internet use (but not e-prescribing, electronic health records, or personal digital assistants) was associated with *slightly* better knowledge of copayments (adjusted predicted percentage of 23% vs 11%; $P = .04$).
- Future investments in health information technology should consider how to improve its design so that physicians can easily access cost information at the point of care.

hospitalists, academic teaching faculty, residents in training, retired physicians, and physicians without accurate contact information based on phone directory and Internet searches. A total of 460 physicians remained, similar to the number identified in a separate unpublished study using claims from Hawaii's largest insurer, Hawaii Medical Services Association, which captures approximately 60% of Hawaii's residents and contracts with the vast majority of local physicians. (These independent claims analyses identified 415 adult primary care physicians who were the main providers for ≥ 20 Hawaii Medical Services Association members with diabetes.) We mailed these physicians a 10-minute, 27-item survey with no financial incentives, followed by 3 mailings to nonrespondents. Of 281 participants (61% response rate), 34 were ineligible (eg, saw ≤ 20 patients per week); therefore, final analyses were based on 247 participants. The institutional review board at the University of Hawaii approved this study.

Survey Description

Physicians were asked, "Do you regularly use the following IT in clinical care (yes/no)?" for the Internet, electronic health records (EHRs), e-prescribing, and PDAs.³ This question referred to both software (Internet, EHRs, e-prescribing) and hardware (PDAs) forms of IT often used by physicians in clinical settings. Because potential overlaps can exist between different IT types, we allowed physicians to answer yes to all functionalities that applied. For example, physicians who used EHRs with e-prescribing functionality could respond yes to use of both EHR and e-prescribing. We did not ask physicians about the specific functionalities of the IT types that they reported using.

To assess physicians' use of clinical resources when prescribing, we asked, "Do you regularly use any of these resources to help you choose a medication for your patient (yes/no): peers/consultants, health plans, pharmaceutical representatives, pharmacists, and medical journals?"¹¹ With respect to knowledge of drug costs, physicians reported how often they knew copayments, formularies, or retail prices, and how often they checked formularies when unsure of coverage or discussed

drug costs with patients (almost always, most of the time, some of the time, rarely/never). Physicians also were asked, "How important is it for you to consider the cost of a medication to your patient?" and "How many of your patients do you think have difficulty paying for their medications?" Lastly, physicians reported demographic (age, sex, specialty) and practice (eg, number of formularies, solo vs group practice) characteristics.^{6,8,9,12,13}

The survey was tested for ease of understanding and question comprehension in a convenience sample of 5 physicians.

Analyses

To examine the association between different types of IT use and drug cost knowledge, we used multivariate logistic regression to predict 3 main outcomes: (1) usually or always knew copayments, (2) usually or always knew retail prices, and (3) had no difficulty in determining formulary coverage. We used the 4 separate IT types as our main predictors: Internet, EHR, e-prescribing, and PDA. In sensitivity analyses, we created a composite IT score by assigning 1 point for each type of IT used and summing these points. The composite score (0 to 4) was not statistically significant in predicting any of the 3 outcomes, and detailed results are not presented.

We adjusted our model for sex, solo versus group practice, years in practice, number of formularies, and use of clinical resources. We excluded age and practice setting because they were highly correlated ($r > 0.40$) with years in practice and solo versus group practice. We excluded provider type because it did not approach significance in bivariate analyses. Results are presented as adjusted predicted percentages with 95% confidence intervals for greater ease of understanding.

RESULTS

Physician Characteristics

Most of the 247 respondents were general internists (55%) and family physicians (36%) in solo (43%) or small practices (48%), and 70% faced 6 or more formularies (**Table 1**). Nearly all reported that their patients had difficulty paying for medications (99%) and that considering drug costs for patients was important (98%). The majority of respondents (65%) said they discussed medication costs with patients most of the time (49%) or always (16%). The remainder said they discussed these costs sometimes (31%) or rarely (4%).

Use of Information Technology

Approximately 8 in 10 physicians used at least 1 type of IT regularly in clinical care (Table 1): Internet (60%), e-prescribing (54%), EHRs (43%), and PDAs (37%). Nearly two-thirds (62%) regularly used 2 or more IT types. With respect to using clinical resources when choosing medications, physicians reported using information from pharmacists (69%), followed by peers (56%), pharmaceutical representatives (48%), medical journals (46%), and health plans (45%).

Knowledge of Drug Costs

Fewer than 1 in 5 physicians often knew copayments or retail prices when prescribing, and 68% reported difficulty knowing formulary coverage (Table 2). Only 1 in 4 physicians regularly checked formularies when unsure whether a drug was covered. Nearly all said that difficulty knowing formulary coverage (94%) and copayments (91%) were significant barriers to considering drug costs for patients.

Impact of Information Technology

In analyses adjusting for sex, solo versus group practice, years out from training, number of formularies, and use of clinical resources, physicians who regularly used the Internet in clinical care were slightly more likely to report that they usually knew copayments (adjusted predicted percentage of 23% vs 11%; $P = .04$) (Table 3). Neither EHR, e-prescribing, nor PDA use was significantly associated with physicians reporting better knowledge of copayments. For formulary coverage and retail prices, none of the 4 types of IT were significantly associated with better knowledge.

Physicians who faced 6 or more formularies in clinical care were less likely to know copayments (15% vs 26%; $P = .048$) and formulary coverage (26% vs 46%; $P = .006$). However, physicians who used information from health plans reported better knowledge of copayments (25% vs 13%; $P = .01$) and formulary coverage (40% vs 26%; $P = .03$). With respect to retail prices, the use of pharmacists approached but did not reach statistical significance in predicting physicians having better knowledge of prices (24% vs 12%; $P = .07$).

■ **Table 1.** Physician Characteristics (n = 247)

Physician or Clinic Characteristic	Percentage ^a
Mean age, y (SD)	50.0 (17.2)
Male	68
Specialty	
General internist	55
Family physician	36
General practitioner	9
Mean years since internship (SD)	17.2 (10.2)
Practice setting	
Private practice	71
Community health clinic, other	29
No. of physicians in practice	
Solo practitioner	43
2-10	48
≥11	9
No. of health plan formularies faced in clinic	
1	1
2-5	29
6-10	48
≥11	22
Information technology used regularly in clinical care	
Use at least 1 type of information technology	79
Internet	60
Electronic prescribing software (e-prescribing)	54
Electronic health record	43
Personal digital assistant	37
Clinical resources used when choosing medication	
Pharmacists	69
My peers or consultants	56
Pharmaceutical representatives	48
Medical journals	46
Information on drugs and cost from health plans	45

^aValues are percentages unless indicated otherwise. Percentages do not add to 100% due to rounding.

DISCUSSION

In this statewide survey of primary care physicians, we were surprised that although 8 in 10 participants said they regularly used at least 1 type of health IT in clinical care, we detected only a modest association between IT use and better knowledge of drug costs. Use of the Internet was associated with slightly better knowledge of copayments (23% vs 11%; $P = .04$). However, even among those who regularly used the

■ **Table 2.** Physicians' Knowledge of Drug Costs (n = 247)

Type of Knowledge	Percentage
Know copayments for patients with insurance	
Rarely	30
Sometimes	52
Most of the time	15
Always	3
Know retail prices for patients without insurance	
Rarely	41
Sometimes	40
Most of the time	16
Always	3
Easy or difficult to find formulary coverage information	
Very difficult	26
Somewhat difficult	42
Neither	9
Somewhat easy	13
Very easy	11
Check formulary when unsure of coverage	
Rarely	31
Sometimes	44
Most of the time	20
Always	5
Barriers to considering drug costs for patients	
Difficulty knowing which drug is on the formulary	94
Difficulty knowing my patient's copayment	91
Not enough time	83
Difficulty knowing whether there are less expensive but equally effective alternative drugs	68
Difficulty knowing which patients want me to consider cost	48
Difficulty knowing which drugs my patient has already tried	43

Internet, the majority of physicians still reported poor knowledge of drug costs.

We are aware of only 1 prior study that assessed multiple types of IT use and physicians' knowledge of drug costs. In this 2003 study, Shrank et al surveyed physicians (49.6% response rate) identified from the California Medical Association, whose members represented one-third of California physicians.⁵ In contrast with the results from our more recent survey, the authors found that "computer order entry" (not further defined) but not Internet use was associated with greater awareness of drug costs.⁵ Neither that study nor ours represent national samples, but our findings should alert policymakers, insurers, and IT providers to reevaluate, as additional money is spent on health IT,^{1,2} the ability of current and future IT systems to

successfully provide cost information to physicians at the point of care.

Our findings should not discount the potential future usefulness of certain types of IT in increasing physicians' access to drug cost information.¹⁴ Although our participants who reported regularly using e-prescribing did not report better knowledge of drug costs, the integration of formulary information support into prescribing software has been shown to decrease both out-of-pocket and total drug costs.^{10,15} Fischer et al analyzed claims for 2 Massachusetts insurers 18 months after the implementation of an e-prescribing system with formulary decision support, and found that physicians were more likely to prescribe lower-cost drugs.¹⁰ McMullin et al found that use of an e-prescribing system with integrated clinical and cost information decreased the likelihood of physicians prescribing higher-cost drugs from 35.8% (control group) to 17.5% (intervention group).¹⁵

At the time of our study, an informal review indicated that several health plans in Hawaii made copayment and formulary information available via the Internet, but not necessarily via EHR, e-prescribing, or PDA. A highly promoted type of e-prescribing software in Hawaii contained formulary information only for the single health plan that sponsored its adoption.¹⁶ Thus, we speculate that this may have been why use of the Internet, but not other IT types, was associated with slightly better knowledge of copayments.

This study indicates that improving physicians' knowledge of drug costs will require more than simply increasing physicians' use of health IT. Given the financial burden of drug costs on patients, there is a critical need to determine if the problem is that drug cost information is not adequately available via various types of IT, physicians are unaware of its availability, or physicians find such cost information too difficult to use. We did not ask physicians who reported using health IT why they still experienced difficulty accessing drug cost information. However, other studies indicate the issue may be the variability among formularies and out-of-pocket costs from patient to patient, as well as the need for further availability of drug cost information via IT.^{5,13} Nearly all of our participants recognized the financial burden of drug costs on patients and the importance of considering out-of-pocket drug costs. However, unless health IT is designed to make the costs of drugs (and other

Information Technology and Drug Cost Knowledge

Table 3. Information Technology Use and Knowledge of Drug Costs^a

Characteristic	Adjusted Predicted Percentage, Mean ± SE		
	Usually Know Copayment	No Difficulty Determining Formulary Coverage	Usually Know Retail Price
All physicians (N = 247)	18	33	19
Internet			
Do not use	11 ± 4	33 ± 5	15 ± 5
Use regularly in clinic	23 ± 3 ^b	31 ± 4	23 ± 4
Electronic health records			
Do not use	17 ± 3	28 ± 4	18 ± 4
Use regularly in clinic	20 ± 4	38 ± 5	22 ± 4
E-prescribing			
Do not use	18 ± 4	31 ± 5	22 ± 4
Use regularly in clinic	19 ± 4	33 ± 5	18 ± 4
Personal digital assistants			
Do not use	21 ± 3	31 ± 4	19 ± 4
Use regularly in clinic	14 ± 4	33 ± 5	21 ± 5
Health plan information			
Do not use	13 ± 3	26 ± 4	16 ± 4
Use as resource in prescribing	25 ± 4 ^b	40 ± 5 ^b	25 ± 4
Pharmacists			
Do not use	14 ± 4	27 ± 6	12 ± 5
Use as resource in prescribing	21 ± 3	34 ± 4	24 ± 3 ^c
No. of years since internship			
≤10	11 ± 5	29 ± 6	23 ± 5
11-20	15 ± 5	30 ± 6	15 ± 5
21-30	21 ± 5	34 ± 6	21 ± 5
≥31	48 ± 9 ^b	44 ± 11	19 ± 10
No. of formularies			
1-5	26 ± 5	46 ± 6	15 ± 5
≥6	15 ± 3 ^b	26 ± 4 ^b	22 ± 3

^aAdjusted for sex, solo versus group practice, and use of peers/consultants, pharmaceutical representatives, and medical journals as prescribing resources.

^bP < .05.

^cApproaching statistical significance at P = .07.

medical services) automatically available at the point of care, physicians and patients will likely continue to be hampered in obtaining healthcare that is appropriate from both a cost and a quality perspective.

Among our participants, no single type of IT was used by more than 60% of physicians. National estimates of physicians' use of different types of IT for clinical care are generally lower than 50%: 41% use the Internet for computerized decision support,⁴ 13% to 26% use EHRs,^{3,17} 10% to 13% use e-prescribing,^{6,18} and 26% to 47% use PDAs.^{6,19} Thus, cost information will need to be accessible via *multiple* IT types to

achieve a wider impact in improving physicians' knowledge of drug costs.

There are several important limitations to this study. We sampled physicians from a single state, and the impact of IT use on physicians' knowledge of drug costs will vary depending on how well cost information is integrated into local IT systems. Our findings, however, show that in at least 1 state, even physicians with very high levels of IT use still experience substantial problems accessing drug costs, and this issue warrants policy intervention. Our results are based on self-report, and physicians could have overreported or un-

derreported their actual use of IT. Physicians reported only whether they regularly used IT in general clinical care; we did not ask specifically about their use of IT to retrieve drug cost information. Further studies are needed to determine whether physicians use IT specifically to access drug cost information and if so, how. If they do not use IT to access drug cost information, the reasons why must be investigated. Physicians also self-reported their knowledge of drug costs, and actual knowledge is likely to be even poorer.¹¹ We focused on busy, community-based primary care physicians, and our results cannot be generalized to specialists or physicians who see fewer patients.^{5,6}

CONCLUSION

Despite high rates of health IT use in clinical care, there was only a modest association between IT use and physicians reporting better knowledge of drug costs. Policymakers and insurers should examine the integration of cost information into future health IT systems and its usability by community physicians at the point of care.

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