Continuing Medical Education

Influence of Physician Factors on the Effectiveness of a Continuing Medical Education Intervention

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Background and Objectives: *Continuing medical education (CME) is essential for improving the quality of care in primary health care settings. This study's objective was to determine how the characteristics of family physicians influenced the effectiveness of a multifaceted CME intervention to improve the management of acute respiratory infection (ARI) or type 2 diabetes (DM2).* Methods: *A secondary analysis was conducted based on data from 121 family physicians, who participated in the educational intervention study. The outcome variable was positive change in physician's performance for treatment of ARI or DM2. The exposure variable was multifaceted CME intervention. Independent variables were professional physicians and organizational characteristics. Analysis included log binomial regression modeling.* Results: *Factors influencing positive change included, for ARI, participation in the CME intervention and medical director interested in that condition and for DM2, participation in the CME intervention, medical director interested in DM2, and being a teacher.* Conclusions: *Physicians' characteristics and organizational environment influence the effectiveness of educational intervention and are therefore relevant to the implementation of CME strategies.*

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Health care institutions are increasingly aware of the importance of continuously improving quality of care through various activities, among which continuing medical education (CME) is key.[1-5] The challenge is to provide effective and sustainable CME interventions.

In the year 2000, a multifaceted CME intervention aimed at improving case management of acute respiratory infections (ARI) and type 2 diabetes (DM2) was conducted in primary care facilities belonging to the Mexican Institute of Social Security (IMSS).[6] IMSS is the largest health care system in Mexico, providing care to 40 million people, and 14,000 family physicians staff its primary care services. The institution carries out CME activities on a routine basis and performs research-based CME studies.[7,8]

In recent years, there has been growing interest in evaluating the effectiveness of CME activities in improving medical performance.[1,4,10] Given the existence of factors that may modify responses to CME interventions,[11,12] some authors have analyzed the theoretical basis of physicians' prescribing behavior exposed to different methods of education, proposing explanatory models that include psychosocial factors, attitudes of physicians toward their own practice, the doctor-patient relationship and patient feedback, the type of illness treated, and aspects of the physician's working environment.[11,13-17] This paper analyses the influence of the professional physicians (personal, academic, and occupational) and organizational characteristics on the effectiveness of a CME strategy.

Methods

The CME intervention addressed ARI and DM2, the two most common causes of visits to primary care facilities. These conditions were selected for the intervention because of well-known management problems, such as over-prescription of antibiotics for ARI and incomplete case management for DM2.[3,7-9]

The CME intervention had baseline and post-intervention evaluations, and performance indicators were

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used to evaluate its outcome. The evaluations were done through measuring the proportion of positive change above the baseline evaluation. The primary analysis showed 32.7% improvement in appropriate prescription of antibiotics, a 53.8% increase in education to the patient with ARI, and a 29.0% improvement in appropriate prescription of hypoglycemic drugs, without changes in dietary and exercise recommendations for DM2.[9]

Subjects and Setting

The present report is based on data from 121 family physicians who participated in the CME intervention. The physicians worked in eight practices, non-randomly selected into four intervention and four control clinics. The physicians were part of the permanent medical staff of the clinics, and they voluntarily agreed to be interviewed at the end of the CME intervention. The study was approved by the IMSS Institutional Review Board.

Intervention

The CME intervention focused on integrated case management and included development of clinical practice guidelines, training of clinical instructors (CI), and a three-stage CME strategy. The CME strategy was comprised of group interactive workshops, individual tutorial activities (the CI worked individually with a family physician in the examining room providing care to actual patients) and peer-review sessions on clinical cases. A detailed description of the CME strategy, including the time required for every stage and its estimated costs, were published elsewhere.[6]

The outcome variable measured in this study was the effect of the educational intervention, assessed by noting changes in appropriateness of the care provided by the physicians for ARI or DM2 patients.

Evaluation

Information to evaluate physicians' performance was obtained by interviewing at least four patients (with ARI or DM2) per physician during a typical working day. We also reviewed written prescriptions and clinical records before and after the CME intervention.

Evaluations were made in accordance with criteria defined on the basis of clinical guidelines.[18-21] Performance was judged to be positive for ARI when physicians' recommendations to their patients included educational aspects (education about alarm signs of respiratory distress, home care, and predisposing factors for ARI) and appropriate antibiotic prescription (antibiotic justified and well selected). For DM2, treatment was considered appropriate when it included correct prescriptions for hypoglycemic drugs and advice on nutrition and exercise.

The effect of the CME course was considered positive when the physician changed from a negative to a positive performance after participating in the CME intervention. Positive performance was defined based on the compliance of two criteria: (1) appropriate case management in at least 50% of patients at the final evaluation and (2) difference in at least 25% of patients with appropriate case management between baseline and final evaluation.

The physicians completed a semi-structured, self-administered questionnaire. The questionnaire consisted of the following professional physicians' characteristics. The first was "personal," such as age and sex. The second was "academic," including specialty, participation in CME activities (defined as having attended at least one course during the previous year), participation as a teacher in educational activities directed to health providers or users, authorship of scientific publications, subscription to medical journals, and membership in medical societies. The third was "occupational," such as years of professional practice, shift (morning or evening), type of employment (permanent or temporary), additional remunerated job, contact with pharmaceutical representatives, and participation in administrative or managerial duties. The physicians also answered a questionnaire regarding their professional expectations (ie, anticipating retirement, continued practice, change in practice, etc).

Other variables were organizational characteristics in respect to CME activities. The variables considered were: access to libraries, consulting rooms for in-service training activities, availability of facilities to carry out academic activities, availability of a person to coordinate educational and research activities, existence of educational programs, and evidence of medical director's commitment to improving quality of care specific for ARI or DM2 (Table 1).

Analysis

All the covariates were analyzed by using descriptive statistics. We compared the intervention and control groups to determine whether there were any significant differences. Cross tabulations using X^2 test and Fisher's exact test were used to examine categorical data and compare groups. We used Mann-Whitney U test for independent groups for comparisons of discrete data. Prevalence ratios (PRs) and 95% confidence intervals were estimated to evaluate crude associations between each variable and physician's performance.

Next, a log-binomial regression was performed using a backward method. The regression model included significant ($P<.20$) and plausible variables to identify characteristics independently associated with positive changes in physicians' performance. For the purposes of this modeling, the CME intervention was taken as the exposure variable, and physicians' characteristics and organizational characteristics were included as covariates.

Table 1

Physicians' Characteristics

Characteristic	*Intervention n=64 n (%)*	*Control n=57 n (%)*	*Total n=121 n (%)*
Age (years)			
Median (interval)	46 (36–65)	47 (35–63)	46 (35–65)
Gender			
Male	40 (62.5)	36 (63.2)	76 (62.8)
Female	24 (37.5)	21 (36.8)	45 (37.2)
Occupational characteristics			
Shift			
Morning	33 (51.6)	32 (56.1)	65 (53.7)
Afternoon	31 (48.4)	25 (43.9)	56 (46.3)
Years of professional practice			
Median (interval)	17 (5–30)	19 (1–28)	18 (1–30)
1–5	1 (1.6)	2 (3.5)	3 (2.5)
6–10	5 (7.8)	8 (14.0)	13 (10.7)
11–15	17 (26.6)	8 (14.0)	25 (20.7)
16–20	23 (35.9)	18 (31.6)	41 (33.9)
≥ 21	18 (28.1)	21 (36.8)	39 (32.2)
Other remunerated activities	31 (48.4)	23 (40.4)	54 (44.6)
Private practice	14 (45.2)	16 (69.6)	30 (55.6)
Public practice	10 (32.3)	3 (13.0)	13 (24.1)
Other	7 (22.6)	4 (17.4)	11 (20.4)
Managerial duties	16 (25.0)	17 (29.8)	33 (27.3)
Contact with pharmaceutical representatives	15 (23.4)	17 (29.8)	32 (26.4)

Log-binomial regression was selected based on the assumption that this is a different alternative to analyze cross-sectional or longitudinal data.[22] This method allows obtaining a direct estimation of the relative risk with accurate confidence intervals, decreasing overestimation caused by odds ratio.

Statistical analysis was carried out separately for each cause of visit, ARI or DM2. Stata 9.0 software for Windows was used for the analyses. The power of the study was 80%, at the 90% confidence level, considering a positive change of 15% in physicians' performance for DM2 in the control group.

Results

A total of 121 physicians were interviewed. The response rate to the questionnaire was 100%.

Table 1 shows the characteristics of participating physicians and the conditions of their clinical practices. Overall, 37% of the physicians were women, and the average time in professional practice was 20 years (range 9 to 35 years). Almost half had another source of income (private practice or affiliation to another public health care institution); 20% had additional employment outside medical practice. Twenty-seven percent had experience in managerial duties, and more than 25% had contact with pharmaceutical industry representatives. No significant differences were found between intervention and control groups.

With regard to academic characteristics, most of the physicians were family physicians; fewer than 15% had another specialty, and 36% were general practitioners. Less than half had attended at least one course during the previous year, 24% participated in at least one teaching activity, and only 39% subscribed to a scientific journal on a regular basis. The proportion of physicians subscribed to a journal was higher in the control group (49.1% versus 29.7%, $P<.05$). Half of the doctors belonged to a medical society (Table 2).

Main professional expectations (the respondents were given the option to list more than one) were as follows: most of the physicians wanted to continue in clinical practice, either as a family physician or working in the private sector; 20% wished to enroll in another resident training program or to teach or carry out research. Retirement was the expectation of more than half of physicians.

Baseline and Follow-up Physicians' Performance

Table 3 shows the proportion of physicians who provided appropriate case management at the baseline and final evaluation. In the baseline evaluation, there were no significant differences in appropriate case management between intervention and control groups ($P>.05$). The absolute change in performance for the intervention group was 37.7% for ARI and 26.9% for DM2.

Association Analysis

When evaluating the physician characteristics associated with positive change, 13% (n=16) were excluded for ARI, and 6.6% (n=8) were excluded for DM2, in both cases because there were insufficient data to evaluate their performance.

Acute Respiratory Infection (ARI). Table 4 shows the results of the crude and adjusted analysis. Crude analysis demonstrated that physicians (n=105) with the greatest probability of positive change of performance were those receiving the educational intervention. Other statistically significant variables were the presence of a

Table 2

Academic Characteristics of Physicians

Characteristic	*Intervention n=64 n (%)*	*Control n=57 n (%)*	*Total n=121 n (%)*
General practitioner	22 (34.4)	22 (38.6)	44 (36.4)
Specialty	42 (65.6)	35 (61.4)	77 (63.6)
Family medicine	33 (78.6)	33 (94.3)	66 (85.7)
Other	9 (21.4)	2 (0.7)	11 (14.3)
CME courses in past year	24 (37.5)	29 (50.9)	53 (43.8)
Teaching and research activities			
Teaching activities	17 (26.6)	12 (21.1)	29 (24.0)
Authorship of scientific publications	3 (4.7)	5 (8.8)	8 (6.6)
Subscription to medical journals	41 (64.1)	36 (63.2)	77 (63.6)
Subscription to scientific journals*	19 (29.7)	28 (49.1)	47 (38.8)
Membership in medical societies	32 (50.0)	31 (54.4)	63 (52.1)

CME—continuing medical education

* Intervention versus control, *P*=.029

clinical coordinator of education and research, having medical director interested in ARI, having had less than 16 years of clinical practice in the institution, and receiving CME courses in past year.

The variables independently associated with positive change in physician performance in the multivariate analysis were receiving educational intervention (PR= 6.4, 95% CI=1.61,25.42), having a medical director interested in that condition, less than 16 years of clinical practice in the institution, and teaching experience.

Diabetes (DM2). Crude analysis also showed that physicians (n=113) with the highest probability of positive change of performance had participated in the CME intervention (PR=1.89, 95% CI =1.08, 3.30). Other associated variables were having a medical director interested in DM2, having consulting rooms for in-service training activities, having teaching experience, presence of a clinical coordinator of education and research, and having a subscription to a scientific journal. In the final model, there was no improvement in PRs (Table 5).

Table 3

Proportion of Physicians With Positive Performance in Acute or Chronic Disease Before and After the CME Intervention

	Baseline		*Final*		*Absolute Change*	
	Intervention %	*Control %*	*Intervention %*	*Control %*	*Intervention % (95% CI)*	*Control % (95% CI)*
Acute respiratory infection (ARI) (n=105)*						
Appropriate case management	2.6	5.2	40.3	4.9	37.7 (26.8, 48.1)	-0.3 (-0.4, 0.3)
Type 2 Diabetes (DM2) (n=113)**						
Appropriate case management	21.2	13.5	48.1	28.2	26.9 (16.6, 35.8)	14.7 (7.6, 21.8)

CI—confidence interval
n=number of physicians

* ARI: Intervention n=56, Control n=49
** DM2: Intervention n=58, Control n=55

Table 4

Physicians' Factors Associated With Positive Change of Performance in Acute Respiratory Infections

	Positive Change in Physicians Performance n=105			
Variable	*cPR (95% CI)*	P *Value*	*aPR (95% CI)*	P *Value*
CME strategy				
Yes	6.12 (1.46-25.62)	.002	6.40 (1.61-25.42)	.008
No	1.0		1.0	
Medical director interested in ARI				
Yes	4.40 (1.65-11.67)	.001	3.86 (1.52-9.76)	.004
No	1.0			
Years of clinical practice				
< 16	3.33 (1.31-8.42)	.007	2.11 (0.91-4.88)	.078
≥ 16	1.0		1.0	
Teaching activities				
Yes	2.54 (0.61-10.49)	.16	2.36 (0.63-8.74)	.198
No	1.0			
A clinical coordinator of education and research				
Yes	5.04 (1.20-21.09)	.009		
No	1.0			
CME courses in past year				
Yes	3.25 (0.98-10.73)	.03		
No	1.0			

CME—continuing medical education
cPR—crude prevalence ratio
aPR—adjusted prevalence ratio using log-binomial regression
ARI—acute respiratory infection

Discussion

Our results show that physicians' behavior changed differently in respect to acute and chronic diseases. For ARI, the model selected for acute conditions, the effect of CME intervention was greater than that observed for DM2, which represented a chronic illness.

Physicians' characteristics that influenced the effect of the CME intervention were specific for each type of illness. A shorter time of professional practice, which was associated with positive performance change with respect to ARI, may reflect higher motivation toward educational activities in younger doctors or those recently graduated from a residency, and a greater capacity to apply new knowledge in their day-to-day practice, particularly for acute illnesses.

Greater professional experience might be expected to result in higher quality of care, but routine work over many years might also tend to blunt the physician's readiness to accept new scientific evidence and, in consequence, may inhibit modification of performance.[14,17] The need for continuous updating via scientific articles seems to be regarded as more important for chronic illness, since physicians face other obstacles to decision making, related to the complexity of the disease and the expectations of patients.[11,13,16]

Teaching experience was associated with positive change in both models. Physicians who engage in teaching are characterized by a favorable personality, motivation, and attitude, enabling them to improve quality of care because of a positive doctor-patient relationship.[15]

Another finding was that medical directors with particular interest in improving care in respect to specific health problems influenced the effectiveness of CME intervention. Positive management attitudes may have fostered favorable responses by physicians to educational activities, despite the existence of organizational problems such as the excessive demand for consultation and shortages of supplies and equipment.[13,23]

Limitations

The non-random selection of the clinics could be considered a limitation of our methods, since physicians at clinics that participated in the intervention may have had a greater willingness to change than those who did not participate. However, we demonstrated that physicians'

Table 5

Physicians' Factors Associated to Positive Change of Performance in Type 2 Diabetes

	Positive Change of Performance n=113			
Variable	*cPR (95% CI)*	P *Value*	*aPR (95% CI)*	P *Value*
CME strategy				
Yes	1.89 (1.08–3.30)	.02	1.73 (1.01–2.96)	.04
No	1.0		1.0	
Medical director interested in DM2				
Yes	2.09 (1.30–3.35)	.004	1.83 (1.15–2.92)	.01
No	1.0		1.0	
Teaching activities				
Yes	2.11 (1.31–3.39)	.004	1.52 (0.93–2.51)	.09
No	1.0		1.0	
Consulting rooms for in-service training activities				
Yes	2.60 (1.26–5.36)	.003		
No				
A clinical coordinator of education and research				
Yes	2.09 (1.15–3.78)	.009		
No	1.0			
Subscription to scientific journals				
Yes	1.76 (1.06–2.91)	.03		
No	1.0			

cPR—crude prevalence ratio
aPR—adjusted prevalence ratio using log-binomial regression
DM2—type 2 diabetes

characteristics were similar in both intervention and control clinics.

Another limitation is that some work and academic environment conditions were not analyzed in this study. These include physicians' interactions with peers or with physicians from the referral hospital and previous work experience. These variables could have influenced the observed changes in performance.

Moreover, physicians' resistance to adopting new patterns of behavior or abandoning old practices may also depend on the type of illness treated, personal barriers, lack of opportunities for access to CME programs, low motivation for carrying out academic activities, and perception of training needs.[11,24] In this study, such barriers, which were not specifically evaluated, could have been reflected in the physicians' expectations.

Conclusions

In conclusion, physician characteristics such as professional practice, engagement in teaching activities, access to updated information, and organizational aspects of working environment, in addition to management attitudes, might influence the effectiveness of CME programs. We consider these characteristics to be key elements that should be taken into account in attempts to increase the effectiveness of such programs.

Although multifaceted educational interventions can significantly improve physicians' performance in primary care, these programs have to be congruent with the physicians' needs and the organizational context in which they work. Also, once physicians participate in these activities, they should have the necessary resources within the health care services to apply what they have learned. If nothing changes within the health care services, then the physicians can be discouraged, and the CME will have no benefit.

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