Consulting room computers and their effect on general practitioner-patient communication.

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Background. In the western medical world, computers form part of the standard equipment in the consulting rooms of most GPs. As the use of a computer requires time and attention from GPs, this may well interfere with the communication process. Yet, the information accessed on the computer may also enhance communication.

Objectives. The present study affords insight into the relationship between computer use and GP–patient communication recorded by the same GPs over two periods.

Method. Videotaped GP consultations collected in 2001 and 2008 were used to observe computer use and GP–patient communication. In addition, patients questionnaires about their experiences with communication by the GP were analysed using multilevel models with patients (Level 1) nested within GPs (Level 2).

Results. Both in 2008 and in 2001, GPs used their computer in almost every consultation. Still, our study showed a change in computer use by the GPs over time. In addition, the results indicate that computer use is negatively related to some communication aspects: the patient-directed gaze of the GP and the amount of information given by GPs. There is also a negative association between computer use and the body posture of the GP. Computer use by GPs is not associated with other (analysed) non-verbal and verbal behaviour of GPs and patients. Moreover, computer use is scarcely related to patients' experiences with the communication behaviour of the GP.

Conclusions. GPs show greater reluctance to use computers in 2008 compared to 2001. Computer use can indeed affect the communication between GPs and patients. Therefore, GPs ought to remain aware of their computer use during consultations and at the same time keep the interaction with the patient alive.

INTRODUCTION

Since the 1980s, when the computer was introduced to the doctor's office in the western world, its use has steadily increased.[1,2] In 1993, 70% of Dutch GPs had a computer information system, but only 10–15% used electronic medical records (EMR).[3] By 1999, >90% had a computer in the consulting room, of whom 80% used EMR.[4] Corresponding rates of computer use were found in Denmark, Sweden, Great Britain and Canada.[5,6] During consultations, doctors have to integrate the use of a computer into the communication process. Several international studies show that computer use affects the communication between GPs and patients.[7–12] It is conceivable that the more time GPs spend with the computer, the less time there is to interact with the patient. Two studies indicate that computer use results in more doctor-centred and less

patient-centred consultations; GPs communicate less and respond less to the patient.7,8 In addition, computer use appears to be related to a loss of eye contact, less psychosocial exchange and longer visits.9 Reduced non-verbal communication, such as eye contact, may in turn negatively influence patient's satisfaction and the doctor–patient relationship.13 Chan et al.,10 however, did find a positive relationship between GPs' computer use and patient satisfaction.

Almost all patients were happy that their records were stored on the computer and were satisfied with the way the GP used the computer during consultations.

Besides, doctors seem to adapt their computer use to the type of consultation. They reduce computer time in consultations with a psychological content.11 Overall, most patients and doctors have a positive attitude towards the computer and recognize it as an efficient tool.2,7 Apparently, the computer can both enhance and interfere with GP–patient communication.

Previous research has focused on observed behaviour of GPs or the experiences of patients with their GP's computer use and communication skills. In our study, we combine observed behaviour of both GPs and patients and the experiences of patients with the communication behaviour of GPs to provide more insight into the effect of computer use in the consulting room. The aim of the present study was to find out how GPs use their computer during consultations and how computer use affects doctor–patient communication since good communication can be associated with positive outcomes of care.14,15 Moreover, we were interested in changes over time, comparing computer use of the same GPs over two periods.

We hypothesize that computer use by GPs has decreased over time. We expect that use has become more standardized and better integrated with the communication process since GPs are more accustomed to using their computer in 2008 compared to 2001. In keeping with previous studies, computer use was expected to negatively affect the following aspects of GP–patient communication in particular: the expression of patient concerns and GP empathy and the amount of information giving and question asking by both.

This article addresses the following research questions: 1. How do GPs use their computer during primary care consultations and has the type of computer use changed over time? 2. Is computer use by GPs related to GP–patient communication during medical consultations? 3. Is computer use by GPs related to patients' experiences with communication aspects of GPs?

METHOD

To identify computer use by GPs in primary care, we used real-life videotaped GP–patient consultations of the same GPs over two periods of time. Video recording is an optimal method for observing GP–patient communication; the influence of the video recorder on the participants' behaviour is marginal.16 We also analysed questionnaires completed by patients about their experiences with communication aspects of GPs.

This enabled us to compare communication and patient evaluations, given varying degrees of computer use.

Recruitment

Information on both computer use and communication by GPs was collected through two different studies conducted by Netherlands Institute for Health Services Research (NIVEL): (i) in 2000–117 and (ii) in 2007–8. GPs who participated in the studies are all members of the Netherlands Information Network of General Practice (LINH). LINH is a representative network of currently 180 Dutch GPs and 340 000 patients, spread throughout the Netherlands.18 In 2001, all (then 195) GPs in LINH were approached (response 72.8%). For the 2008 study, a sample of 93 GPs was drawn from LINH, with priority given to those who participated in the 2001 study (response 44%). GPs who participated in the 2001 study reflect the population of Dutch GPs regarding age, sex, urbanicity and number of days worked. The doctors who participated in the 2008 research represent Dutch GPs regarding sex and practice form (solo, duo, group practice or health centre). Thirty-five doctors participated in the 2001 study as well as the 2008 study and were included in the present study. The thirty-five doctors represent Dutch GPs regarding age, practice form and number of days worked. In 2008, each of these GPs worked in the same practices as they did in 2001.

Data collection

For one or two random days, an unmanned camera was installed in the consulting room of the GP concerned.

All patients who had an appointment with the GP were approached by a researcher in the waiting room, who requested (written) informed consent and handed out questionnaires. Per GP, _20 consultations were

recorded in 2001 and 2008, of which _15 per GP were observed in 2001 and 20 per GP in 2008. Hence, consultations of 465 patients in 2001 and of 705 patients in 2008 were included in the study (1170 consultations in total)**.**

Observations

Videotaped consultations were reviewed by several observers, using an observation list. For each consultation, observers described when and how the GP used the computer. Besides 'no computer use', seven categories of computer use were defined (Yes/No)**.**

The computer may be used:

a. to search for or read something (e.g. during history taking)

b. to prescribe medication or refer a patient

c. while the patient is changing clothes (for physical examination)

d. while the GP is talking

e. while the patient is talking

f. while the patient waits silently

g. for other purposes (e.g. to make an appointment)**.**

During a consultation, one or more categories of computer use may be applied. In addition, several non-verbal measures of the GP were observed on a three-point scale: (i) the amount of 'nodding' and (ii) 'smiling' was observed, ranging from infrequent to very frequent and (iii) the 'body posture of the GP towards the patient' was described, ranging from closed to open. Furthermore, (iv) we calculated the percentage of patient-directed gaze, by dividing the proportion of time a GP looks at the patient by the consulting period (minus the duration of the physical examination). The Roter interaction analysis system (RIAS) was used to code verbal communication behaviour; each utterance (word or sentence) by the GP and patient was coded from a list of 40 codes.[19] We selected (and clustered) the following categories: the number of questions asked by patients and GPs, the amount of information given by patients and GPs, the number of concerns or worries patients show and the amount of verbal attention (empathy and partnership) GPs show towards patients**.**

Questionnaire

Patients completed the Quality of Care through the Patients' Eyes (QUOTE) communication questionnaire, [20,21] after the recorded consultation in 2001 and 2008. They described their experience regarding communication aspects of the doctor on a four-point scale**.**

For example, 'the doctor listened to me well' (1 = not, 2 = not really, 3 = yes and 4 = yes definitely). The items could be divided into two categories, based on a factor analysis:[20] an affect-oriented scale of seven communication aspects and a task-oriented scale of six communication aspects (with a Cronbach's alpha of 0.75 and 0.86, respectively). Affect-oriented communication consists, for example, of attentive and empathic behaviour by the GP—listening and showing interest in the patient. Task-oriented talk includes exchanging information and advice, diagnosing and problem solving (see Appendix 1)**.**

Interrater reliability

Six observers were trained to observe the behaviour of GPs and patients during consultations in 2008**.**

To compute reliability, 70 of the same consultations were reviewed by different observers. We calculated the interrater reliability between (two) observers with Cohen's kappa and the interrater reliability for the RIAS categories (between four observers) with Pearson's R (Table 1)**.**

For all the categories of computer use, kappa shows a substantial or almost perfect interrater reliability**.**

The observed non-verbal behaviours (body posture, nodding and smiling) show moderate interrater reliability**.**

The interrater reliability is also high for the observed verbal behaviour and patient-directed gaze but low for the concerns or worries expressed by patients and the empathy GPs showed towards the patient (see Table 1)**.**

[TABLE 1]

Statistical analyses

First, we compared categories of computer use between 2001 and 2008, using T-tests. Second, to take into account the variation in communication skills between GPs, multilevel models with random intercepts (multilevel linear regression and multilevel Poisson regression) were used, consisting of patients (Level 1)

nested within GPs (Level 2). The categories of computer use (0 = no use and 1 = use) and year (0 = 2001 and 1 = 2008) were coded as dummy variables. We designated 'no use' (for example, the GP did not use the computer to search for or read something) and the year '2001' as reference groups. P levels of <0.01 were considered significant because of the large number of tests. We performed analyses using Stata version 10**.**

RESULTS

Characteristics of GPs and patients

Tables 2 and 3 describe the characteristics of the participated patients (n = 1170) and GPs (n = 35). Neither patients' gender nor age differed between the two studies**.**

Computer use by GPs during consultations

In 2001 and 2008, all participating GPs had a computer in their consulting room. Although GPs used their computer in almost every consultation in 2001 and 2008 (Table 4), there are significant differences in the number of consultations in which a computer is used between 2001 and 2008 (P < 0.01). GPs used their computer during fewer consultations in 2008, for almost all categories of computer use. The consultations were significantly longer in 2008 (10.5 minutes) compared to 2001 (9.8 minutes)**.**

COMMUNICATION ASPECTS IN RELATION TO COMPUTER USE BY GPS

[TABLE 2], [TABLE 3], [TABLE 4]

Non-verbal communication aspects.

When GPs use a computer, this is related to a loss of eye contact withthe patient (Table 5). Computer use and GP's body posture towards the patient, as well as the amount of nodding by the GP are also somehow related. Although there is a negative association between a GP's computer use and open body posture, this is only significant when the GP was talking. Besides, GPs 'nodded' less when they used the computer, but only while the patient was waiting silently. The degree of smiling by a GP is not related to computer use**.**

On the whole, GPs in 2008 had a significantly higher level of patient-directed gaze, a more open patientdirected body posture and they nodded and smiled more than in 2001**.**

Verbal communication aspects of patients.

Computer use by GPs does not appear to be related to the number of questions asked by patients or the number of concerns or worries a patient shows (Table 6). Overall, the correlation between computer use and amount of information given by patients is negative. Computer use is negatively associated with the amount of information given by patients while waiting silently. However, computer use is positively related to the amount of information patients give to their GPs while the GP is talking. In 2008, patients gave significantly less information to their GPs during consultations compared to 2001**.**

Verbal communication aspects of GPs.

Computer use by GPs is not related to the number of questions asked by GPs or the amount of verbal attention (empathy and partnership) GPs show (Table 7). On the other hand, GPs give less information to patients when they use a computer while the patient is talking. In 2008, GPs gave significantly less information and showed less empathic behaviour towards their patients than they did in 2001**.**

Experiences of patients with the communication aspects of GPs

Computer use by the GP is not related to his or her affective behaviour, as experienced by patients (see Table 8). Furthermore, according to patients, the amount of instrumental behaviour of GPs did not significantly change in relation to their computer use**.**

Only when the patient is waiting silently during the GP's computer use, is this associated with more instrumental behaviour of the GP according to patients**.**

Relationships between GPs' computer use and communication aspects of GPs and patients do not differ between 2001 and 2008 (results of interaction analyses not shown)**.**

CONCLUSIONS AND DISCUSSION

To our knowledge, this study is the first to offer insight into computer use by the same GPs comparing two time periods. Our results show that both in 2001 and in 2008, GPs used a computer in almost every consultation.

However, GPs used a computer during fewer consultations in 2008 than they did in 2001 and the kind of computer use by GPs during consultations differs between 2001 and 2008. GPs were more sparing with computer use in 2008. It is possible that GPs use their computer more efficiently and that computer use is better integrated into the communication process in 2008 compared to 2001. Another explanation for the decrease in computer use in 2008 is the possibility that GPs used their computer more before or after consultations and less during the actual conversation with the patient.

[TABLE 5], [TABLE 6], [TABLE 7], [TABLE 8]

On the other hand, computer use can still affect communication. Our study demonstrates that the use of consulting room computers is associated with aspects of GP–patient communication, by negatively changing the proportion of time a GP looks at a patient and the amount of information given by GPs during consultations. There is also a negative link between a GP's computer use and his or her body posture towards the patient and the amount of information given by patients. These results were found both in 2001 and in 2008, and are consistent with previous research, showing that the use of a computer affects the degree of eye contact by the GP and time spent interacting with the patient.[9,12] In contrast, our study shows that computer use is not associated (or only to a very small extent) with other (analysed) non-verbal and verbal behaviour of GPs, like smiling or the number of questions asked by patients and GPs. It is possible that both patients and GPs have become familiar with computer use during consultations and ask the same number of questions whether a computer is in use or not.

In addition, computer use is scarcely related to patients' experiences with the communication behaviour of the GP. Only when the patient is waiting silently during a GP's computer use, is this associated with more instrumental behaviour of the GP according to patients. Apparently, patients perceive the computer predominantly as an instrumental tool and do not associate it with less affective behaviour of the GP.

As mentioned before, the amount of information given by GPs and patients is negatively associated with computer use in 2001 and 2008. But we also found that the computer was used in fewer consultations in 2008, and both GPs and patients gave less information in 2008 compared to 2001. The decrease in computer use during consultations does not seem to have resulted in an increase in the exchange of information.

We imagine that certain types of computer use can be more negative for GP–patient communication than others. While the patient is changing clothes (for physical examination), and at the same time the GP uses the computer, we interpret this as having (in general) no negative effect on communication. But when the computer is used while the GP or patient is talking, this can have a more negative effect. GPs should be more discerning about their style of computer use.

An important strength of our study is that we were able to compare consultations of the same GPs over two time periods. Some limitations should also be noted. First, our study was chiefly based on a number of communication aspects of GPs and patients. Taking account of the opinions of patients on computer use by GPs was beyond the scope of the study. However, previous research indicates that patients have no problem with the use of a computer during consultations.

[10,22] Second, we should mention that the data on the number of concerns patients expressed and the amount of empathy GPs showed were not reliable and therefore the relationship found between computer use and these behaviours should be treated with caution. In addition, differences between the observed behaviour of GPs and patients in 2001 and 2008 may be partly due to differences between observers.

However, observers in 2001 and 2008 used the same protocol and were trained by the same trainer. Furthermore, although all 35 GPs are members of a representative network for Dutch general practice (LINH), it is possible that these GPs differ in terms of motivation, skills in particular in relation to information technology and attitudes to computers from other (Dutch) GPs. Lastly, the use of the same GPs 7 years apart can lead to confusion between cohort and period effects.

Consequently, our findings also reflect 7 years of more experience by GPs or 7 years of increased age.

Despite these limitations, our research offers worthwhile insight into computer use by GPs over two periods of time and its influence on several communication aspects during consultations. Above all, the

computer can be seen as a tool for GPs to trace medical information and delivered care. In doing so, GPs should be aware of computer interference and how this can affect the communication with the patient. As stated above, effective communication contributes to health outcomes like patient satisfaction, pain control and symptom resolution.14,15 Further research is needed to detect which style of computer use is best for both GPs and patients, especially in relation to the fundamental role of EMR in general practice.

TABLE 1   *Interrater reliability, Cohen's kappa and Pearson's correlation*

	Kappa[a]	
Computer use		
No computer use	1.00	
To search for or read something	0.80	
To prescribe or refer a patient	0.95	
While the patient is changing clothes (for physical examination)	0.93	
When the GP is talking	0.61	
When the patient is talking	0.75	
While the patient waits silently	0.93	
Non-verbal measures		
Body posture of the GP	0.49	
GP nodding	0.43	
GP smiling	0.51	
Patient-directed gaze	0.80[b]	
	Pearson's correlation[c]	
	2001	**2008**
Verbal measures		
Questions asked by patients	0.77	0.90
Information given by patients	0.86	0.84
Patient concerns/worries	—	0.25
Questions asked by GPs	0.90	0.80
Information given by GPs	0.90	0.79
GP empathy	—	0.51

[a]Kappa value interpretation: below 0.00 = poor, 0.00–0.21 = slight, 0.21–0.40 = fair, 0.41–0.60 = moderate, 0.61–0.80 = substantial, 0.81–1.00 = almost perfect.
[b]The interrater relability for patient-directed gaze was measured using Pearson's correlation.
[c]Pearson's correlation interpretation: below 0.30 = poor, 0.3–0.50 = slight/fair, 0.51–0.80 = moderate/substantial, 0.81–1.00 = almost perfect.

TABLE 2   *Patient characteristics in 2001 and 2008 (n = 1170)*

	2001 (n = 465)	2008 (n = 705)
Patients		
Mean age (SD)[a]	43 (22)	43 (23)
Gender (%)[a]		
Male	38	40
Female	62	60

[a]No significant differences.

TABLE 3   *Characteristics of GPs (n = 35) in 2001[a]*

GPs	
Mean age (SD)	47 (6)
Gender (%)	
Male	71
Female	29

[a]GPs were 7 years older in the 2008 study.

TABLE 4   *Percentage of consultations in which GPs (n = 35) used their computer, 2001 and 2008*

Categories of computer use	2001 (n = 465) (%)	2008 (n = 705) (%)
No computer use*	0.6	9.7
a. To search for or read something*	78.4	63
b. To prescribe or refer a patient*	54.8	43.1
c. While the patient is changing clothes*	28	16.1
d. When the GP is talking*	31.7	21.9
e. When the patient is talking*	42.9	26.4
f. While the patient waits silently*	37	19.8
g. Other computer use	3.5	3

*Significant difference between 2001 and 2008, t-test, $P < 0.01$.

TABLE 5 *Non-verbal communication aspects of GPs, related to their computer use (multilevel linear regression)*

	Patient-directed gaze of the GP (% of consultation)		Body posture of the GP (1 = closed and 3 = open)		GP nodding (1 = infrequent and 3 = very frequent)		GP smiling (1 = infrequent and 3 = very frequent)	
	Beta	$P < 0.01$	Beta	$P < 0.01$	Beta	$P < 0.01$	Beta	$P < 0.01$
Computer use (in general)	−17.80	0.00*	−0.20	0.01	0.00	0.99	−0.03	0.70
Computer use: to search for or read something	−3.61	0.04	−0.04	0.33	−0.01	0.81	0.01	0.79
Computer use: to prescribe or refer a patient	−9.10	0.00*	−0.09	0.01	−0.01	0.84	0.03	0.41
Computer use: while the patient is changing clothes	−7.82	0.00*	−0.11	0.01	0.04	0.41	0.06	0.18
Computer use: when the GP is talking	−5.71	0.00*	−0.17	0.00*	0.04	0.38	0.07	0.49
Computer use: when the patient is talking	−2.73	0.05	0.01	0.82	−0.01	0.67	−0.08	0.06
Computer use: while the patient waits silently	−7.86	0.00*	−0.09	0.05	−0.15	0.00*	−0.11	0.01
Year 2008 (with 2001 as reference)	8.79	0.00*	0.18	0.00*	0.16	0.00*	0.13	0.00*
Mean variation between GPs (SE)	71.60 (19.43)		0.03 (0.01)		0.07 (0.02)		0.09 (0.02)	

*Significant $P < 0.01$.

TABLE 6 *Verbal communication aspects of patients during consultations, related to the GP's computer use (multilevel Poisson regression)*

	Number of questions asked by patients (per minute)		Amount of information given by patients (per minute)		Number of concerns or worries shown by patients (per minute)	
	Beta	$P < 0.01$	Beta	$P < 0.01$	Beta	$P < 0.01$
Computer use	−0.38	0.06	−0.09	0.14	−0.08	0.87
Computer use: to search for or read something	0.03	0.77	0.06	0.05	0.02	0.91
Computer use: to prescribe or refer a patient	0.02	0.84	−0.06	0.03	−0.26	0.21
Computer use: while the patient is changing clothes	0.06	0.63	−0.03	0.28	−0.12	0.61
Computer use: when the GP is talking	0.04	0.70	0.09	0.00*	0.15	0.49
Computer use: when the patient is talking	−0.29	0.04	−0.08	0.01	0.04	0.86
Computer use: While the patient waits silently	−0.04	0.72	−0.21	0.00*	0.01	0.97
Year 2008 (with 2001 as reference)	−0.22	0.03	−0.22	0.00*	−0.48	0.02
Mean variation between GPs (SE)	0.00 (0.00)		0.01 (0.00)		0.00 (0.00)	

*Significant $P < 0.01$.

TABLE 7 *Verbal communication aspects of GPs towards patients during consultations, related to their computer use (multilevel Poisson regression)*

	Number of questions asked by GPs (per minute)		Amount of information given by GPs (per minute)		Amount of verbal attention (empathy) GPs show towards patients (per minute)	
	Beta	$P < 0.01$	Beta	$P < 0.01$	Beta	$P < 0.01$
Computer use	−0.18	0.08	−0.23	0.00*	−0.45	0.24
Computer use: to search for or read something	−0.01	0.83	0.01	0.87	−0.05	0.80
Computer use: to prescribe or refer a patient	−0.08	0.13	−0.06	0.06	−0.12	0.48
Computer use: while the patient is changing clothes	0.06	0.36	0.04	0.33	−0.00	0.99
Computer use: when the GP is talking	0.01	0.81	−0.03	0.50	−0.02	0.93
Computer use: when the patient is talking	0.09	0.17	−0.17	0.00*	−0.10	0.66
Computer use: while the patient waits silently	0.03	0.64	−0.11	0.01	−0.41	0.05
Year 2008 (with 2001 as reference)	0.04	0.48	−0.01	0.00*	−0.94	0.00*
Mean variation between GPs (SE)	0.06 (0.02)		0.03 (0.01)		0.10 (0.08)	

*Significant $P < 0.01$

TABLE 8 *Experiences of patients with communication aspects of GPs, related to GP's computer use (multilevel linear regression)*

	Affective behaviour of GPs as experienced by patients (1 = not and 4 = yes definitely)		Instrumental behaviour of GPs as experienced by patients (1 = not and 4 = yes definitely)	
	Beta	P < 0.01	Beta	P < 0.01
Computer use	0.01	0.80	0.14	0.29
Computer use: to search for or read something	0.01	0.68	−0.02	0.76
Computer use: to prescribe or refer a patient	−0.01	0.57	0.03	0.49
Computer use: while the patient is changing clothes	−0.00	0.97	0.06	0.31
Computer use: when the GP is talking	0.02	0.46	0.13	0.01
Computer use: when the patient is talking	−0.01	0.71	0.14	0.02
Computer use: while the patient waits silently	−0.00	0.95	0.16	0.00*
Year 2008 (with 2001 as reference)	0.02	0.33	0.16	0.00*
Mean variation between GPs (SE)	0.00 (0.00)		0.01 (0.01)	

*Significant P < 0.01.

APPENDIX

Affective communication aspects:
-the doctor gave me enough attention
-the doctor listened well to me
-the doctor took enough time for me
-the doctor was friendly
-the doctor was frank with me
-the doctor took my problem seriously
-the doctor was empathic towards me

Instrumental communication aspects:
-the doctor diagnosed what's wrong
-the doctor explained well what's wrong
-the doctor informed me well on the treatment
-the doctor gave advice on what to do
-the doctor helped me with my problem
-the doctor examined me

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