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Camera-Related Behaviors during Video Recorded Medical Interactions

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Abstract Video recording provides an objective record of the content of medical interactions. However, there is concern that cameras may be reactive measurement devices that alter what normally transpires during interactions. This study addressed potential reactivity of cameras in medical interactions. Interactions between 45 patients and 14 medical oncologists were video recorded and coded for camera-related behaviors. Eleven of 45 patients performed none of the behaviors. Among the other patients, camera-related behaviors were infrequent and, on average, constituted about 0.1% (one-tenth of one percent) of total interaction time. Behaviors occurred most often in very early stages of interactions, and when physicians were absent from the room. Seven physicians showed camera-related behaviors, comprising less than 0.1% of the time they were in the interaction. Results suggest video recording can provide nonreactive means of studying medical interactions.

Keywords camera-related behaviors · real-time data capture · reactivity · video recording · medical interactions · nonverbal communication

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Introduction

It is generally agreed that the content and quality of exchanges between patients and their physicians play a critical role in the short and long-term medical outcomes of these interactions (e.g., Roter, 2003). For this reason, scientific interest in understanding what transpires during these interactions has increased in recent years. This report concerns one method of gaining information about physician-patient interaction, real-time video recording.

Real-time recordings of medical interactions are generally considered superior to post-interaction interviews with patients and physicians because retrospective self-reports of behavior often may provide biased or factually inaccurate accounts of what occurred during the interaction (Andersen & Adamsen, 2001; Chan, Vernon, Ahn, & Greisinger, 2004; Jobe, 2003; Stone et al., 1998). Researchers who use real-time recordings can use either audio recordings alone or audio recordings combined with video. One advantage of video recording is that it may be able to capture a larger range of data compared to other observational methods such as voice recording (Coleman, 2000; Inui & Carter, 1985). Bavelas and Chovil (2000) argue that face-to-face communication is comprised of both ‘‘audible and visual acts... completely interwoven in interactional behavior’’ (p. 164). Thus, video recording offers a reliable method of capturing critical nonverbal aspects of communication such as touch, facial expression, or physical proximity that can only be assessed via visual observation (Ford, Hall, Ratliffe, & Fallowfield, 2000; Riddle et al., 2002). Despite these arguments for video recording of medical interactions, concern continues about the potential problems associated with video recording.

Two main concerns with the use of video recording to observe patient-physician interactions are based on the fact that, relative to audio recordings, they are more reactive and intrusive and thus: 1) the presence of the camera may alter patients’ and physicians’ behavior, reducing the usefulness of video recording for studying doctor-patient interaction, and 2) video-recording may be unethical. With regard to the latter, some researchers have argued that a significant proportion, and sometimes a majority of patients, feel pressured to consent to video recording or are made to feel uncomfortable or hesitant to disclose as much information to providers as they might otherwise have (Bain & MacKay, 1993; 1995). However, Bain and MacKay based their argument, in large part, on a study in which participants responded to a hypothetical scenario in which they were being asked whether they would volunteer to actually be video recorded during a consultation with their physician. Most studies in which patients were asked to volunteer to actually be video recorded have reported high consent rates. For example, Neal, Ali, Allgar, and Coleman (2004) obtained a 91% agreement rate, while 85% and 77% consent rates for video recordings of medical consultations were obtained by Ram et al. (1999) and Campbell, Sullivan, and Murray (1995), respectively. The data also suggest fairly uniformly that patients whose physician visits are video recorded are no less satisfied with their visits than patients who are not recorded (Campbell et al., 1995) and are unlikely to feel uncomfortable or experience negative emotions during the recording (Hargreaves & Peppiatt, 2001). One study (Herzmark, 1985) did find that being video recorded resulted in lower doctor-patient rapport, but only among a minority of patients.

Now we turn to the other major concern about the use of video recording to observe patient-physician interactions: whether the presence of the camera alters patients' and physicians' behavior, reducing the validity and usefulness of video-observation for studying doctor-patient interaction. Physician responses to being video recorded appear to be unremarkable. Only a minority of physicians who volunteered to be video recorded during routine consultations reported that their behavior was influenced by the recording (Ram et al., 1999). This finding is consistent with a second study that compared physician activities when they were aware of being video recorded to when they were taped surreptitiously (Pringle & Stewart-Evans, 1990). Physicians' behaviors varied as a function of awareness of being video recorded on only one of 27 activity dimensions – fewer than the number of differences that would be expected simply due to chance.

Relatively little is known about the influence of camera awareness on patient behavior during medical consultations. This is in part due to the inherent challenges of demonstrating that patients' behavior is *not* changed by the camera's presence. One might consider adopting a study design similar to that used by Pringle and Stewart-Evans (1990). In this study, a camera was present and visible during physician-patient consultations. Before five interactions, the physicians were informed that they were being video recorded, and their behaviors during these interactions were compared to behaviors in five other interactions in which they were not aware that they were being recorded. This study, while important, has two possible shortcomings for studying patient awareness. First, strictly speaking, there was no condition in which the physicians believed that recording was not possible (because no camera was present). Thus, it is possible the mere presence of a camera affected the physicians during *all* interactions. Such an effect would be consistent with social psychological research on how mirrors and cameras affect individuals' levels of self-consciousness (e.g., Buss, 1980). Conceptual issues aside, from a practical point of view, persuasively arguing for the null hypothesis (i.e., that the camera had no impact on behavior) requires extremely large sample sizes to achieve high levels of power. This problem is more easily solved when studying physicians who participate in large numbers of consultations over a short period of time, than with patients who can only be expected to participate in a single interaction. Recruiting enough patients to make it reasonable and appropriate to accept null results might not be an effective use of resources. Further, even if such recruitment goals were realized, there are possible ethical problems with conducting a study that involves deceiving large numbers of patients about whether or not they are being video recorded (Coleman, 2000).

One alternative to experimentally manipulating awareness of being recorded is to ask patients to self-report on their camera awareness and behavior changes after they have participated in a video-recorded consultation. The handful of studies that have examined whether patients felt self-conscious when they were video recorded report that patients commonly say they forgot they were being video recorded (e.g., Hargreaves & Peppiatt, 2001; Martin & Martin, 1984). One problem with this post hoc self-report approach is that it is always possible that, when asked to retrospectively report the degree to which they reacted to or were conscious of the camera, people underestimated their camera awareness and the influence of the video recording process on their behavior.

Given these constraints, we chose to assess awareness of and reactions to a camera in an absolute rather than a comparative way. Specifically, we first identified a set of behaviors (described below) that prior research and/or common sense suggest reflect camera awareness and reactivity. Trained coders then viewed a set of video recordings of actual interactions between physicians and their patients, and for each group, recorded how often these behaviors occurred, when they occurred, and how long they lasted. These data provided information on the frequency and duration of the camera-related behaviors. Based on our prior experience with video recordings of physician-patient interactions (see Albrecht, Blanchard, Ruckdeschel, Coovert, & Strongbow, 1999; Riddle et al., 2002), we expected the selected behaviors would be relatively infrequent and last for short periods of time. However, we also thought that certain kinds of camera-related behaviors might be more common than others. Thus, the first goal of this study was to determine the relative frequency and duration of several different camera-related behaviors.

In addition to examining the overall frequency and duration of patient and physician camera-related behaviors, we also examined the correlates of differences in the frequency and duration of such behaviors among patients and physicians. We investigated whether any demographic attributes were related to camera-related behaviors and then looked at how certain aspects of the interactions might affect the frequency and duration of these behaviors. Specifically, we first looked at whether the frequency/duration of such behaviors changed across the course of the interaction. Based on prior work in nonmedical settings (e.g., Behnke & Sawyer, 2002; Kassin, 1987), we predicted that participants would desensitize to the cameras relatively quickly and, thus, camera-related behaviors would be most common in the early portions of the interaction and would decline across time. Second, we also examined how the presence of the physician in the examination room affected the patients' behaviors. It was predicted that camera-related behaviors would be much more frequent when the physician was out of the room. This prediction was predicated on the notion that when the physician is in the room, the patients would essentially be in a divided attention task (e.g., Marcantoni, Lepage, Beaudoin, Bourgouin, & Richer, 2003). In such tasks, humans usually cannot efficiently and effectively process competing stimuli and thus choose among them for which one commands their attention. In the present case, we assumed that patients would pay much more attention to a physician discussing topics such as their diagnosis, prognosis, and treatment than to a camera.

We conducted an extensive electronic literature search and used list serve queries in an attempt to identify behaviors that indicated awareness of/or reactions to a camera. The research literature contained several articles on the utility of video recording medical interactions (e.g., Roter, 2003) and the ethics of such recordings (e.g., Butler, 2002), but little in the way of guidance for selecting the behaviors. Thus, the authors and their colleagues engaged in extended discussions about what behaviors would reflect awareness of and reactions to the camera. This led to the identification of seven behaviors: looking at the camera, talking about the camera or the fact that one was being taped, gesturing toward the camera, whispering or lowering one's voice so it might not be picked up by a microphone, covering one's mouth or face while speaking, partially or fully obstructing the camera's view, and "self-reflective behaviors." The last class of behaviors requires some elaboration. Research in personality and social psychology suggests that under certain conditions people may experience a state of public self-awareness, in which there is a heightened concern for the thoughts and feelings of others and a resultant desire to make a positive impression (Nezlek, 2002). Many situations can increase public self-awareness, but there is some reason to believe that the presence of a camera is one of them (Buss, 1980). Thus, we coded for nonverbal behaviors that indicated a concern about one's appearance. Examples would include things such as adjusting one's clothes, cleaning or grooming one's clothes, fixing one's hair, and applying make-up. These behaviors would suggest people were aware that others were observing them.

Study 1

Method

Participants and Procedure

Participants were 20 oncology patients and seven physicians at a large comprehensive cancer center in the southeastern United States. These physician-patient interactions were randomly selected from a larger set of 74 video recorded interactions collected at this location by Albrecht and her colleagues as part of their study of patient accrual to clinical cancer trials (see Albrecht, Penner, & Ruckdeschel, 2003; Riddle et al., 2002). One patient failed to provide demographic information; 11 of the remaining 19 patients (58%) were male and all but one were European American. Their modal educational level was ''some college'' and their mean age was 58.26 years (*SD* = 13.67). Ninety percent of the patients were accompanied during the interaction by one or more relatives or friends during the interactions. The patients selected for this investigation did not differ significantly from the larger set of patients on any demographic characteristics. Physicians were all male oncologists; one was African American; the six others were European American. One oncologist appeared in eight of the tapes, another appeared in five; the remaining five oncologists appeared in one or two of the tapes each. Six of the seven physicians provided background information. Five of them had been in practice for more than ten years, the others for three to five years.

Patients were approached while they waited to see their physician. The study was explained to them and then informed consent (and after April 2003, HIPAA) forms were distributed. As part of the consent process, patients and physicians were informed that the study was being conducted to gain a better understanding of how verbal and nonverbal communication affects patients' ''decisions about cancer treatment.'' Interest in the effects of cameras on their verbal and nonverbal behaviors was not explicitly mentioned, but the informed consent form explicitly stated that the interactions would be video recorded and this was repeated by the recruiters. After signatures were obtained, patients completed a brief questionnaire concerned with demographic and personal history information. The recordings took place in outpatient examination rooms. The cylinder containing the cameras was placed at the end of a small table that separated the physicians and patients while they talked; no effort was made to hide or conceal the fact that there were cameras in the cylinder. In almost all instances, the cameras were connected by a research assistant while the patients were in the room waiting for the physicians. Recording typically began within 15 s to 30 s after the research assistant left the room and ended when the physician concluded the interaction by leaving the room.

Video recording A complete description of the video recording system can be found elsewhere (e.g., Albrecht et al., 2003, 2005); here we provide only a brief description. The system was comprised of two major components: mobile cameras encased in enclosures and a remote monitoring and recording unit. The camera enclosures were cylinders made of shaded acrylic glass (the contents were thus not visible externally) and contained two high-resolution digital cameras fitted with wide-angle lenses, stacked atop one another with a microphone. Separate cameras within the same cylinder recorded the behaviors of physicians and patients on separate video recorders. Audio and video output cables from the cameras were plugged into special wiring units in the wall of each room. At another site we visually monitored and recorded the ongoing interaction between the physician and patient. A special touch screen panel enabled the remote control of each camera in order to track the movement of participants. A time code generator/reader automatically inserted synchronized time codes on the physicians' and patients' tapes for later viewing and coding/analysis.

Coding Four individuals were used as coders; all had been trained on the behaviors of interest and the Noldus Observer Video-Pro® software system. The Noldus Observer Video-Pro® is a system for collection, analysis, presentation, and management of observational data. In this system, MPEG2 video images, along with a user-defined coding matrix, are simultaneously displayed in windows on the computer monitor for coding. The coding matrix was comprised of eight "behavior classes" for each participant (patient and physician). They were: presence in the room, and whether or not he/she was engaging in the seven camera-related behaviors previously described (i.e., camera-oriented looking, talking, gesturing, whispering, covering face or mouth, obstructing the camera's view, and self-reflective behaviors). When the coders observed the occurrence of a behavior class, they clicked the "on" cell in the coding matrix when the behavior began (e.g., patient look, or physician talk) and the "off" cell when it ended (e.g., patient not look or physician not talk). This produced event logs for all the behavior classes of interest, and for each participant, the times that each of the camera-related behaviors occurred and their duration. Coding of the physicians' and patients' behaviors was done separately by the coders.

Results

Interjudge Reliability

In order to determine the intercoder reliability, on ten of the 20 tapes, the patients' behaviors were independently coded by two coders. Cohen's Kappa was used to estimate the interjudge reliabilities.[1] On five of these ten tapes, there was 100%

[1] Given the nature of the coding task, some data preparation was necessary before Kappa could be computed. This was because coders did not simply place discrete behaviors into different categories - the typical framework that lends itself to the use of Kappa - but rather also essentially coded when behaviors did *not* occur. We divided tapes into 4-min segments and counted the number of times within a segment when: a) Both coders identified the same behavior taking place at the same time (any event taking place within 10 seconds was classified as occurring at the same time; b) both coders agreed a behavior had *not* taken place within each segment, this would produce six agreements, the number of behaviors which coders were coding; c) coder A identified a behavior but coder B did not; and d) coder B identified a behavior but coder A did not.

agreement that patients displayed none of the target behaviors, and thus for these tapes, Cohen's Kappa was not computed. The average Cohen's Kappa for the remaining five tapes was .68 (range = .40 to 1.00). In those instances where an interaction was coded by more than one person and there was disagreement as to whether a behavior had occurred, the behavior was coded as occurring and used in the analyses of camera-related behaviors. Similarly, if there was a disagreement between the judges on the duration of a behavior, the *longer* of the two judge's duration estimates was used.

Patients' Camera-Related Behaviors

The average length of time patients spent in the examination room was 56.95 min (*SD* = 28.45; *Mdn* = 53.70; range = 16.91 to 115.6). On average, the physicians entered the room 21.29 min (*SD* = 17.41; *Mdn* = 15.64; range = 0.0 to 97.12 min) after the recordings began, and the average amount of time physicians spent with the patients was 36.09 min (*SD* = 17.42; *Mdn* = 38.55; range = 8.53 to 69.83).

Frequency and duration of camera-related behaviors On 8 of the 20 tapes (40%) the patients did not display any camera-related behaviors. The remaining 12 patients engaged in a total of 50 instances of camera-related behaviors. If we include all 20 patients, the modal number of patient camera-related behaviors was zero, and the mean and median number of behaviors displayed were 2.50 (*SD* = 3.44) and 1.00, respectively. The mean and median duration of camera-related behaviors were 3.95 s and 1.97 s. The patients' camera-related behaviors, on average, constituted less than one-tenth of one percent of the interaction time (*M* = 0.08%; *Mdn* = 0.04%).

By far, the most common patient camera-related behavior was looking at the camera, which was performed by 11 of the 20 patients a total of 36 times (72% of all the camera-related behaviors; *M* = 1.80, *SD* = 2.98 for all 20 interactions); 5 patients talked about the camera 7 times (*M* = .35; *SD* = .75); 2 patients each gestured about the camera once; 1 patient engaged in 1 self-reflective behavior and 1 whispered about the camera 4 times. Covering one's face/mouth and obstructing the camera never occurred.

Correlates of camera-related patient behaviors The number of camera-related behaviors was not related to patient age, gender, education, or income. It was not possible to analyze for the effects of companions being present or absent, as companions were present in 90% of the interactions coded, but the number of companions in the room was not associated with differences in camera-related behaviors.

It was expected that camera-related behaviors would decline over the course of the interactions. Because of the small number of camera-related behaviors observed overall, we combined the entire patient camera-related behavior codes for the purpose of these analyses. In addition, because our focus was how camera-related behaviors were affected by time and context, the analyses that follow were based on only the 12 patients (out of 20) who showed at least one camera-related behavior. In the first analysis of the effects of time on the behaviors of interest, we divided the interactions into 4-min segments, and recorded the frequency of the behaviors across the 24 segments (no behaviors occurred after the 24^{th} segment). Next, we correlated segment numbers (i.e., 1 to 24) with the frequency of the behaviors. The correlation was negative and significant, $r(22) = -.50, p < .01$. The relationship between time and the frequency of the camera-related behaviors is displayed in Figure 1.

One potential problem with this analysis was that the interactions varied greatly in length and thus two behaviors that occurred at the same *absolute* time in two interactions might have occurred at quite different relative times in these interactions. For example, a camera look that occurred 15 min into the interaction would have occurred almost at the end of the shortest interaction (which lasted about 16 min), but very early in the longest interaction (which lasted almost two hours). Thus, we divided the each of the interactions into equal quarters and looked at the relative frequencies of the behaviors within each quarter.[2] Sixty-four percent of all camera-related behaviors occurred in the first quarter of the interactions; this declined to 12% in the second quarter; and 10% and 14% in each of the last two quarters, respectively.

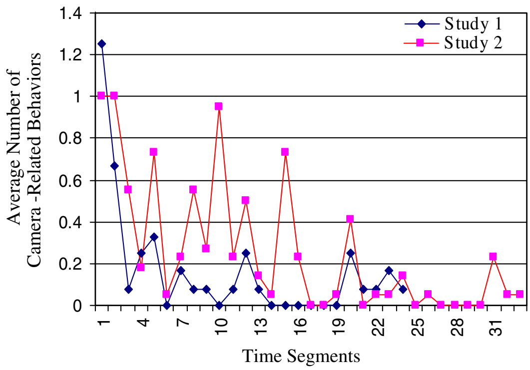
The high incidence of camera-related behaviors in the first quarter led us to further examine the pattern of behaviors within this quarter. Specifically, we examined the relationship between time and the incidence of camera-related behaviors *within* the first quarters of the interactions. We divided the first quarters into segments of 60 s each, numbered the segments in which behaviors occurred from one to 17 (no behaviors occurred after 17 min of the first quarter) and correlated this with a distribution representing time with the frequency of the behaviors in each segment (i.e., the numbers 1 through 17). The correlation was $r(15) = -.53$, $p < .05$, indicating that the frequency of camera-related behaviors declined significantly across time *within* the first quarter of the interactions.

It was predicted that camera-related behaviors would be substantially less frequent when the physicians were in the room. Consistent with this prediction, 76 % of patients' camera-related behaviors occurred while the physicians were out of the room, but physicians were out of the room only 43% of the time the interactions were recorded. The difference between these two proportions was significant, $z(50) = 4.77$, $p < .01$. We also grouped behavior frequency into four categories based on the distribution of behaviors across patients: (none, low [1 or 2], medium [3 or 4], and high [5 or more]) and examined the relationship between the two variables. The phi coefficient (.47) was significant, $p < .02$. The presence of the physicians was significantly associated with lower frequencies of camera-related behaviors.

Next, we examined the conjoint effects of time and physician's presence on camera-related behaviors. We again divided the interactions into segments of 240 s each, and numbered the segments in which behaviors occurred consecutively from one to 24; then within each segment we dummy-coded physician presence/absence and multiplied the two variables to produce an interaction term. The interaction term was entered into a hierarchical linear regression after time and physician status; behavior frequency was the criterion variable. As would be expected, the zero-order beta weights for both time and physician present/absent were significant, and the multiple regression was significant, $F(3, 44) = 4.10$, $p < .01$. However, in the final regression equation, the only predictor variable with a significant regression weight

[2] Because the interactions varied substantially in length, the quarters also varied in length, from just over four min to almost 28 min.

Fig 1 Frequency of camera-related behaviors in Studies 1 and 2 as a function of time



was time and the inclusion of the Time X Physician (present/absent) interaction term did not significantly change the R^2 value when it was entered into the equation.

Finally, we again divided the interactions into equal quarters and looked at the conjoint effects of quarters (1, 2, 3, 4) and physicians (present/absent) in a two-way, repeated measures analysis of variance (ANOVA). The effect of quarters was significant, $F(3, 11) = 4.09$, $p < .05$, as was the effect of physician present/absent, $F(1, 11) = 10.67$, $p < .01$, and the Quarter X Physician (present/absent) interaction term, $F(3, 33) = 4.20$, $p < .01$. A comparison of the individual cell means disclosed that there were significantly more camera-related behaviors in the first quarter than in any other quarter, but no significant differences among the other quarters. The significant interaction appeared to be due to the fact that there were significantly more camera-related behaviors in the first quarter when the physician was absent than when the physician was present, t_{paired} (11) = 2.29, $p < .05$, but this difference was not significant in any of the other quarters. The duration of the camera-related behaviors was unrelated to time elapsed in the interactions and the presence/absence of the physician.

The last analysis of the Study 1 patient data was an exploratory examination of whether something about the individual physicians might have influenced the frequency of the patients' camera-related behaviors. We looked at patients' data for two physicians who each participated in at least five interactions (50% of the interactions recorded). We examined the intraclass correlations for the frequency of patient camera-related behaviors for the two physicians. A significant intraclass correlation would have indicated substantially less variability among patients who saw the same physician than among the patients of these two physicians combined, suggesting that something about these physicians had similar effects on the patients' camera-related behaviors across the different interactions. However, the intraclass correlation was .03, *ns*, meaning that there was no less variability in behaviors of patients who saw the same physician than across the two physicians.

Physicians' Camera-Related Behaviors

Two of the seven physicians (29%) displayed eight camera-related behaviors in four interactions (two per physician). One physician looked at the camera once and talked about it twice; the other physician looked three times, and talked about and gestured toward the camera once. The mean and median duration of these behaviors was 3.18 s (*SD* = .45) and 1.63 s, respectively. On average, these behaviors constituted 0.1% of the time the physicians spent with patients.[3] Using data from all the physicians produces much lower estimates of camera reactivity. The modal number of camera-related behaviors was zero, and, on average, these behaviors consumed 0.03% of the time the physicians spent with the patients. Because of the extremely low frequency of physician camera-related behaviors, no further analyses were conducted.

Study 2

The data from Study 1 appear to make a persuasive argument for a low level of camera-related behaviors in this medical setting, and substantial decrements in such behaviors as a function of time elapsed and the physician being in the room. However, before drawing strong conclusions, some alternative explanations must be ruled out. Foremost among these is that our results were, for some reason, peculiar to the setting in which the data were collected. That is, it was possible that things such as the specific placement of the cameras in the examination rooms, where the patients and physicians sat during the interactions, or some other contextual factors limited the generalizability of these findings. Therefore we conducted a second study.

As in Study 1, the oncology consultations were video-recorded as part of a larger study conducted in a comprehensive cancer center. The center was located in a different region of the United States, and the demographic characteristics of patients and physicians sampled differed somewhat from those sampled in the first study. The two studies also diverged in the following potentially more important ways. First, whereas all the patient participants in the first study were consented in a waiting area, most of the patients in the second study were asked for consent when they entered the examination room. The cameras were not in the examination rooms when patients entered. Once these patients were consented, the cameras were brought in and recording started within 15 s to 30 s, but patients typically had been in the rooms for 5 to 10 min before the recordings began. By contrast, in Study 1, patients were in the room for a minute or less before the recordings began. Second, in Study 2, patients and physicians varied substantially in where they sat during the interactions, whereas in Study 1 the furniture arrangement led all the physicians and patients to sit on either side of a small table. Third, two cylinders (each containing one camera) were used in Study 2, whereas only one cylinder (containing two cameras) was used in Study 1, The two cylinders were placed on carts in the corners of the room in order to capture the entire field of vision in the examination room. But in Study 1 the camera cylinder was placed on the table at which the patients and physicians sat, and the cameras typically only captured the upper torso of the patients and physicians.

The coding scheme used in Study 2 was identical to the one used in Study 1 with the exception of two minor refinements. First, we expanded the category ''talk about the camera'' to include instances when people laughed about being video recorded, or laughed about the cameras. Although not explicitly talk, laughter, for example, in response to someone else's talk about the camera, suggests awareness of the camera

[3] The denominator is the time the physicians were actually in the room.

and has a communicative function. Second, a small adjustment was made to the "self-reflective behavior" category. In Study 2 we coded two types of these behaviors, fixing clothes and putting on makeup, whereas in Study 1 we had also coded fixing one's hair. This behavior was dropped in Study 2 because coders were not able to reliably agree on whether specific instances of touching hair were for self-presentation purposes or simply to be more comfortable (e.g., scratching one's scalp or moving hair out of one's eyes).

Another difference in the coding between the two studies was that in Study 1 only 50% of the recordings were coded by multiple judges; in Study 2 two judges coded each recording. This gave us a better estimate of the reliability of the coding and decreased the likelihood that a substantial number of camera-related behaviors would be missed because a single judge did not notice them. Finally, in Study 2, we were able to ask many of the patients about their reactions to the cameras.

We expected that the absolute number and duration of camera-related behaviors would, relative to the time spent in the examination room, again be quite small. However, we also expected that the absolute number of behaviors observed would be substantially greater than in Study 1. On average, the time patients spent in the examination room was longer in Study 2 than in Study 1 and the physicians were in the room somewhat less time than in Study 1. Given that in Study 1 patients performed fewer camera-related behaviors while physicians were present, we expected that the absolute number of camera-related behaviors performed by patients would be greater in Study 2 than in Study 1. Additionally, as already noted, in Study 2 there were two separate cylinders containing cameras. We expected that if a person was motivated to look at a camera, he/she might look at both cameras, which would be coded as two looks.

Despite expecting differences in the absolute numbers of camera-related behaviors, we predicted that the passage of time across the interactions and the presence of the physician in the room would again substantially reduce the incidence of camera-related behaviors. The reasoning for these predictions was the same as in Study 1.

Method

Participants and Procedure

Participants were 25 oncology patients and seven physicians at a large comprehensive cancer center in the Midwestern United States. The 25 interactions were randomly selected from about 100 interactions recorded at this center as part of the same larger study noted earlier. Forty-four percent of the patients were male; 80% were European American; 12% were African American, and 8% did not report their ethnicity. There was a bimodal distribution on education with the most common responses being "completed high school" and "some college" and their mean age was 55.84 years (SD = 15.32). Ninety-two percent of the patients were accompanied by one or more relatives or friends during the interactions. Physicians were seven male oncologists; two had practiced three to five years, one had practiced six to ten years, and four had practiced more than ten years. All were European American.

Other than the differences earlier described, the data collection procedure in Study 2 was essentially identical to that used in Study 1, with one addition. One week after the video-recording, participants were contacted for a telephone interview. The primary purpose of this interview was to gather information for the previously mentioned larger study for which the video recordings were being made; however, questions were included about patients' camera awareness. They were: "To what extent did you notice the cameras were present?" and "To what extent did the cameras affect your behavior?"

Coding Four coders and one of the authors (HO) were involved in coding the tapes. An extensive training process involved coding tapes (not included in the study sample), and refining decision rules until coders reached an acceptable level of inter-rater reliability. Next, each tape was coded by two coders. Any discrepancies were later resolved via consensus-discussion between the two coders and the author. The frequencies and durations that resulted from the consensus judgments were used in the analyses that follow.

Results

Interjudge Reliability

Because of the absence of camera-related behaviors in three recordings and very few camera-related behaviors in others, it was impossible to compute Kappas on seven of the 25 tapes. The mean Kappa for the remaining 18 recordings was .66 (SD = .13); the inter-rater reliability of the coding of physician behaviors for all recordings was marginally higher (M = .73, SD = .10).

Patient Camera-Related Behaviors

On average, patients were in the examination room for 82.04 min (SD = 29.52). Physicians entered the room an average of 39.37 min (SD = 27.78) into the recording. The mean time physicians spent in the consultation room was 34.43 min (SD = 31.35). Thus, the time spent in the examination room by patients in Study 2 was 40% longer than the time spent in the examination room by patients in Study 1, but on average the physicians in Study 2 spent slightly *less* time in the room (M = 34.43 min versus 36.09 min).

Frequency and duration of camera-related behaviors On 3 of the 25 tapes, the patients did not display any camera-related behaviors. Across all 25 patients, an average of 7.80 camera-related behaviors were displayed per interaction (SD = 7.99; Mdn = 5.25) (range = 0 to 29). As expected, the average per patient frequency of camera-related behaviors was significantly greater in Study 2 than in Study 1, $t(43) = 2.76$, $p < .01$. The average duration of the behaviors was 2.93 s (SD = 4.79 s; Mdn = 1.75 s). Across all 25 patients, camera-related behaviors comprised about 0.07% of the time the patients were in the rooms. This percentage and the average duration of the behaviors did not differ across the two studies.

The most common behavior was talking about the camera, which was performed by 18 of the 25 patients a total of 82 times (M = 3.28, SD = 4.65 for all 25 interactions); 16 patients looked at the camera 51 times (M = 2.04 SD = 2.62); 10 patients gestured 22 times (M = .88 SD = 1.43); 9 patients engaged in 31 self-reflective acts

(M = 1.24 SD = 2.20); 4 patients whispered 7 times (M = .28 SD = .84); and one patient obstructed the camera's view twice.

The larger number of patients and camera-related behaviors in Study 2 made it possible to look at the correlations among the frequencies of these behaviors. The frequencies of talking about the camera, looking at the camera, and gesturing toward the camera were all significantly correlated with one another. The strongest relationships were between talking about and gesturing toward the cameras, $r(23) = .75$, $p < .01$, and looking at and gesturing toward the cameras, $r(23) = .70$, $p < .01$. Looking and talking were less strongly correlated, $r(23) = .43$, $p < .05$. None of the other correlations was significant.

Correlates of patients' camera-related behaviors The number of patient camera-related behaviors was not related to patient education, income, or gender. However, there was a significant negative correlation between number of behaviors and age, $r(25) = -.49$, $p < .05$. It was not possible to analyze for the effects of companions' presence or absence, as companions were present in 92% of the interactions coded, but the number of companions present during the interaction was unrelated to frequency of camera-related behaviors.

As in the first study, we examined how time and context affected the patients' camera-related behaviors. Again, we combined all of the patient camera-related behavior codes for the purpose of these analyses. The first question asked was whether, as in Study 1, the frequency of these behaviors declined across time. We again divided the interactions into 4-min segments, counted the number of behaviors in each segment, and correlated the frequencies with the segment numbers (1 to 33; no behaviors occurred after the 33rd segment). As in Study 1, there was a significant negative correlation between time elapsed and the frequency of the camera-related behaviors in a segment, $r(31) = -.61$, $p < .01$. The relationship between time elapsed and the frequency of behaviors is presented in Figure 1.

We then examined the frequency with which the behaviors occurred in the first, second, third, and fourth quarters of the interactions. Recall, this analysis essentially equated the patients on when in the interaction the behaviors occurred, but, of course, the length of the quarters varied as a function of the overall length of an interaction. The highest percentage of behaviors again occurred in the first quarter (36%) (the percentages in the remaining quarters were 26%, 21%, and 17% respectively.). We again examined the relationship between time and frequency of the behaviors *within* the first quarter of the interactions. As in Study 1, we divided the quarter into one minute segments, numbered the 21 segments (no behaviors occurred after 21 min of the first quarter), counted the behaviors in each segment, and correlated the two. As was the case in Study 1, there was a significant negative correlation between time elapsed within the first quarter and the number of camera-related behaviors, $r(19) = -.63$, $p < .01$.

Turning to the impact of the physician's presence or absence on camera-related behaviors, as was true in Study 1, patients performed significantly more camera-related behaviors when the physician was absent from the room than when the physician was present. Specifically, 81% of patients' camera-related behaviors occurred while the physicians were out of the room, but physicians were out of the room 58% of the time the interactions were recorded. The difference between these two proportions was significant, $z(195) = 9.34$, $p < .001$. Again, we grouped behavior frequency into four categories based on the distribution of behaviors in Study 2 (none, low [1 to 5], medium [6 to 10], and high [11 to 15] and extremely high [more than 15]) and examined the relationship between the two variables. The phi coefficient (.49) was significant, $p < .02$. As in Study 1, the presence of the physicians was significantly associated with lower frequencies of camera-related behaviors.

We again looked at the conjoint effects of time and the presence/absence of the physicians on the frequency of camera related behaviors. We coded each of the 33 4-min segments according to whether the physician was present or absent. The overall regression equation was significant, $F(3, 63) = 15.56$, $p < .001$. However, in contrast to results from the first study, when all three variables were entered in equation, regression weights for physician present/absent and the interaction term were significant, but the regression weight for time was not. An inspection of the regressions of frequency onto time when physicians were present and absent showed the cause of the interaction. In both conditions, camera-related behaviors became less frequent over time, but this relationship was much stronger when physicians were absent than when they were present.

Finally, we conducted a second analysis of the conjoint effects of time and physicians' presence/absence by dividing the interactions into equal quarters and conducting a two-way repeated measures ANOVA with the variables again being quarters (1, 2, 3, 4) and physician (present/absent). In this ANOVA, only the effect of physician present/absent was significant, $F(1,21) = 8.76$, $p < .01$.

The absence of a significant main effect for quarters and of a significant interaction term in the Study 2 ANOVA was in contrast to significant effects for these variables in the Study 1 ANOVA. This led us to investigate the effects of the variables of interest across the two studies. We conducted a three-way, mixed model ANOVA in which the between-subjects variable was Study (1 versus 2) and the within-subject variables were again quarters and physicians' presence/absence. As would be expected from the earlier analyses, the between-subjects main effect of study was significant, $F(1, 32) = 4.62$, $p < .001$, showing that significantly more behaviors occurred in Study 2. The between-subjects variables did not significantly interact with any of the within-subject effects, but all three of the within-subject F ratios were significant, for quarters, $F(3, 96) = 4.15$, $p < .01$; for physician's presence, $F(1, 32) = 10.28$, $p < .01$; for the Quarters X Physician presence interaction, $F(3, 32) = 2.71$, $p < .05$. An inspection of the individual cell means suggested that the source of the significant interaction was in the first quarter of the interactions, when the presence of the physicians dramatically reduced the frequency of camera-related behaviors. The duration of camera-related behaviors was unrelated to time elapsed or presence/absence of the physicians.

Finally, we conducted another exploratory analysis of whether variability in the frequency of the patient behaviors was influenced by some attribute of the physicians. There were six physicians in Study 2 who participated in more than one interaction. The intraclass correlations for frequency of patient camera-related behaviors for these six physicians was .08, *ns*. Thus, as in Study 1, the variability in behaviors among patients who saw the same physician was not significantly less than the overall variability in the frequency of behaviors.

Self-Reported Camera Awareness

As noted earlier, in Study 2 we asked the patients about reactions to the cameras. Patients reported little camera awareness or camera influence. Mean self-reported ratings of the extent patients "noticed the cameras" from 1 = (*didn't notice them at all*) to 4 = (*noticed them a lot*) was 1.71 (n = 21; SD = 1.01). The mean rating of the extent to which the camera "affected (their) behavior" from 1 = (*not at all*) to 4 = (*a lot*) was 1.05 (n = 20; SD = .22). These responses were uncorrelated with the incidence or frequency of actual camera-related behaviors.

Physicians' Camera-Related Behaviors

Five of the seven physicians (71%) displayed at least one camera-related behavior; these behaviors were distributed across seven of the 25 tapes (28%). Within the interactions where the behaviors were displayed, the mean number was 4.42 (SD = 2.15; Mdn = 3.0). The behaviors, on average, constituted .01% of the time these physicians were in the room. If we had included all 25 recordings, the mean and median number of behaviors would become much smaller and the modal number of physician behaviors across the 25 interactions would be zero. Again, the small number of physician camera-related behaviors precluded further data analyses.

General Discussion

As noted in the introduction, it was not the intent of this study to *prove* that video cameras in a medical examination room are a nonreactive means of capturing the contents of a physician/patient interaction. The paradigm employed precludes such a conclusion. However, the results indicate that in two different medical settings, verbal and nonverbal behaviors in response to the camera occurred rather infrequently and took up very little time. Perhaps a more important finding than the absolute frequency or duration of such behaviors is what the results indicate about *when* patient awareness of a camera, however minimal, is most likely to occur.

The analyses of the relationships between patient demographic characteristics and the incidence of camera-related behaviors yielded only one significant finding across the two studies, a negative correlation between age and the number of behaviors in Study 2. The older the patients were, the fewer camera-related behaviors they displayed. However, given that there is no theoretical reason to expect such a relationship and the age-frequency correlation in Study 1 approached zero, we do not place any great importance on this finding.

The number of camera-related behaviors in Study 2 was significantly greater than in Study 1. It seems most reasonable to suggest that this difference was due to: a) the proportionately shorter amount of time the physicians were in the examination rooms, and b) the use of two separate cylinders to record the camera-related behaviors, and c) that, on average, the video recordings were longer in Study 2 than Study 1. Despite these differences in absolute frequency of the behaviors of interest, the findings were quite consistent across the two studies with regard to the impact of time and whether the physician was in the room.

With regard to time, it seems clear that even though, in both studies the cylinders containing the cameras were in full view of the patients throughout the interactions, the patients appeared to habituate to them relatively rapidly. In both studies, there were significant negative correlations between overall time elapsed and the frequency of camera-related behaviors. This decline in camera-related behaviors seemed to begin quite early in the interactions. A visual examination of Figure 1 discloses that in both studies, the highest frequency of camera-related behaviors occurred within the first four minutes of the recording, and with one exception in Study 2, the frequency within this segment was substantially greater than in any other 4-min segment in the interactions. In Study 1, the majority of the camera-related behaviors (60%) occurred within the first quarter of the interaction; in Study 2, more camera-related behaviors (36%) occurred during this quarter than any other quarter. And in both studies, *within* the first quarter of the interaction there was a significant negative correlation between time elapsed and frequency of the behaviors. The only exception to this pattern of significant decline in camera-related behaviors across time was the nonsignificiant main effect for quarters in Study 2. Nevertheless, when the data from both studies were combined, the main effect for quarters was significant. These results suggest that if patients are sensitive to the cameras, they habituate or desensitize very rapidly. Thus, a conservative strategy to minimize camera effects in medical interactions might be to have a ‘‘warm-up’’ period at the beginning of recordings of medical interactions, in which the cameras are present, but the video recordings made during that time are not used in the analyses of the patients' behaviors.

The presence/absence of the physician also consistently affected the incidence of camera-related behaviors. In both studies, patients displayed significantly fewer behaviors when the physicians were in the examination room than when the physicians were absent from the room. As noted earlier, we believe that this is due to attentional demands. That is, when a physician enters the room and begins discussing the patient's prognosis, treatment, and other related matters, he/she becomes an extremely salient stimulus; as a consequence, much less patient attention would be focused on a camera. This is a very encouraging finding for researchers who wish to study physician-patient interactions.

The examination of the interaction between time and physician present/absent produced different results between the two studies with regard to statistical significance. However, the nature of the relationship between time and physician present/absent and the frequency of camera-related behaviors was quite similar across studies. When data from the two studies were combined in the mixed-model ANOVA, the interaction term was significant. If a physician was present in the later stages of the interactions, the incidence of camera-related behaviors was extremely low. In Study 1, there were only two camera-related behaviors (4% of the total) after the first quarter if the physician was in the room. In Study 2 there were 35 behaviors (18% of the total) after the first quarter if the physician was in the room. Thus, during the last three quarters of the 45 interactions recorded (approximately 40 hours of recordings) there were a total of 37 camera-related behaviors if the physician was in the room. These findings suggest that data collected from patients when a physician is present in the later portion of an interaction would likely be least affected by the presence of a camera.

In this context we should mention that whereas we began recording immediately (Study 1) or shortly after (Study 2) patients entered the clinic rooms, some studies wait until physicians have entered the rooms to begin recording. We assume, however, that in these studies the cameras are usually present during this waiting period (even though they are not turned on). This assumption, plus the finding from the present study that the physicians' presence clearly reduces camera-related behaviors, leads us to predict that these studies might actually produce a substantially lower incidence of camera-related behaviors than we obtained.

Conclusions

There are, of course, some possible limitations and qualifications to this study. One alternative explanation of the study's findings with regard to the low overall levels of camera-related behaviors is that the sample of patients who participated in this study was not representative of the general patient populations in the centers where the study was conducted. If so, this raises the possibility that our results could have been substantially biased by camera-insensitive individuals self-selecting into a study that they knew involved video recordings. Data from the larger study from which these recordings were randomly drawn provide information on a selection bias. Over 85% of patients who were approached, informed about the video recordings, and asked to participate, agreed to do so. Thus any bias in these data due to greater willingness to participate among camera-insensitive individuals was minimal.

At the same time, the interactions recorded are not representative of all medical interactions. They involved oncology patients and their oncologists at tertiary care centers. Most, if not all, of the patients already knew they had cancer and were seeking a second opinion or consultation of some sort. Under such conditions, where critical information may be provided and life-or-death decisions may be made, patients may be less likely to attend to a recording device than would be the case for patients engaged in routine medical interactions. Thus, the influence of a camera on patients' behaviors may be moderated somewhat by the seriousness of the medical interactions in which it is used.

It must be emphasized that there were other potential camera-related behaviors that we did not examine. For example, it is possible that one effect of knowing that you are being video recorded is to make people more civil and polite. People may modify their verbal and nonverbal behaviors in the direction of more positive and socially acceptable actions because of the cameras' presence, and did not code for such behaviors. Future researchers may want to develop a methodology for doing this. We would note in passing, however, that at least one of the patients in the present research did not seem terribly concerned about this. The recording showed him and his companion stealing latex gloves while the physician was out of the room.

Returning to the primary focus of this research effort, we are not arguing that cameras are always a nonreactive means of data capture. Researchers do need to empirically examine the extent to which patients and physicians seem to be reacting to video cameras in an examination room. Further, it would seem important to consider the manner in which the cameras are displayed in this room. In the recording system we have developed, the cameras are encased in a smoked-glass acrylic cylinder. The patients (and physicians) know that the cameras are present, but they cannot see the lens or the body of the camera as it follows them during the interaction. We strongly suspect that if the plastic cylinder had been removed and the camera lens and body were visible, the incidence/duration of the camera-related behaviors would have substantially increased. That is, relative to the kind of camera we used in this study, an uncovered camera pointed directly at a patient would probably be a more salient stimulus in the person's visual field and a more reactive means of data capture. Our data do suggest, however, that at least when the camera was encased in the cylinder, its presence may have had only a small impact on the patients' (and physicians') thoughts, feelings, and actions. And further, this impact was substantially diminished by both adaptation to the camera over time and the patients' attention to their physicians. Thus, under certain conditions video recording appears capable of yielding an ecologically valid record of the content of physician-patient interactions.

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