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Communicating Information to Patients: The Use of Cartoon Illustrations to Improve Comprehension of Instructions

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■ ABSTRACT

Objective: To evaluate the effect of cartoon illustrations on patient comprehension of and compliance with ED release instructions.

Methods: A prospective, randomized, controlled study of consecutive patients who presented to the ED of a community teaching hospital with lacerations necessitating wound repair during a three-month study period. At ED release, the patients were randomly assigned to receive wound care instructions with or without cartoon illustrations. Three days later, the patients were followed up by telephone. A blinded investigator asked a series of questions designed to test the patient's recall of, understanding of, and compliance with wound care instructions.

Results: A total of 234 patients were successfully contacted by telephone; 105 (45%) had been given ED release instructions with cartoons, 129 (55%), without cartoons. There was no significant difference in age, gender, level of education, or satisfaction with the ED visit between the two groups. The patients given cartoon instructions were more likely to have read the instructions (98% vs 79%, $p < 0.001$), were more likely to answer all wound care questions correctly (46% vs 6%, $p < 0.001$), and were more compliant with daily wound care (77% vs 54%, $p < 0.01$). Subset analysis of those patients who had less than a high school education ($n = 57$) demonstrated even larger differences between the two treatment groups in terms of comprehension of and compliance with ED release instructions.

Conclusion: Cartoon illustrations are an effective strategy for conveying information and may improve patient compliance with ED release instructions.

Key words: illustrations; patient instructions; patient follow-up; compliance; discharge instructions; cartoons.

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■ The outcome of minor illness and injury managed in the ED is largely dependent on care rendered after release from the ED. However, the ED team has little control over what patients do after they leave. Many patients follow up with their own physicians or clinics, usually

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at a time related more to convenience than to necessity. Some patients choose their own follow-up care. Others completely ignore ED release and follow-up instructions, often with serious results. Only a fraction of patients recall everything they are told and follow instructions exactly. Identifying which patients will heed ED release and follow up instructions and which ones will not is never an easy task for the emergency physician (EP).¹

Studies indicate that patient satisfaction and compliance with the aftercare plan are related to the amount and quality of information given to the patient and the ability of the patient to comprehend it.²⁻⁷ Efforts to improve ED release and follow-up instructions include verbal teaching techniques, behavior modification, emergency care clinics, postal notification and reminder systems, and ED follow-up clerks.⁶⁻¹⁰ While these methods have significant effects on compliance rates, each method has cost-related drawbacks.

Computer-generated ED release instructions are becoming more popular. However, recent data suggest that even with computerized instruction sheets, compliance can be expected for only 36% of patients.² This poor compliance may be a result of large numbers of functionally illiterate ED patients who are unable to comprehend written instructions.^{2,3} Providing patients with health care information that is easily readable and in a format that encourages reading presents a challenge to EPs.

Cartoons or graphic illustrations are an important element in patient education materials because they engage the interest of the audience.¹¹ The U.S. Department of Defense has used cartoon magazines for many years to convey vehicle and equipment maintenance information to military troops. In 1989, McDermott first explored the use of cartoons as visual aids in medical and health education for adults and children.¹² In this study, we evaluate the effect of cartoon illustrations on patient comprehension of and compliance with ED release instructions.

METHODS

Study Design

This prospective, randomized, controlled investigation was conducted over a three-month period to evaluate the effect of cartoon illustrations on patient comprehension of and compliance with wound care instructions after release from the ED. All conditions and procedures of this study were approved by the Butterworth Hospital Institutional Review Board.

Setting and Population

The study was conducted at Butterworth Hospital, a community hospital and tertiary care facility with an annual ED census of approximately 72,000 patients. All patients who presented to the ED with lacerations necessitating wound repair between April and July 1994 were eligible to participate.

Patients included in the study were English-speaking, were released to outpatient care from the ED, and had home telephones. Parents or guardians of children with lacerations also were eligible to participate. Exclusion criteria included patients released to extended or managed care facilities, those leaving prior to final disposition, and those who received care by consultant services (e.g., plastic surgery) in the ED.

Experimental Protocol

Prior to ED release, all patients were randomly assigned to receive wound care instructions with or with-

TABLE 1 Wound Care Questions

1. Name one thing that can be done to reduce the swelling of your injury.
2. What is a common sign of infection?
3. How often should you clean your wound?
4. Name one thing that can reduce scarring after the stitches have been removed.

out cartoon illustrations. The written text was identical on the two sets of instructions (Fig. 1). The instructions were legible, were written to be understood by a patient with a seventh-grade education, and included information concerning suture removal, wound care, signs of infection, and methods to reduce scarring. Readability was determined by computer software using the Flesch readability formula.¹³ Instruction sheets were kept in white envelopes to prevent the nursing staff from identifying the type of instructions (illustrated vs nonillustrated) until they were reviewed with the patient at the bedside. The envelopes were numbered randomly by a computer.

Three days after ED release, the patients were followed up by telephone survey. Telephone calls were made between 9 AM and 9 PM by an investigator (CD) or a research assistant blinded to the type of instructions received by the patient. Verbal consent was obtained from the patient, or parent/guardian if the patient was <14 years of age, prior to beginning the telephone survey. The interviewer determined the highest level of education completed by the respondent (patient or guardian) and his or her overall satisfaction with the ED visit. Each subject was then asked a series of four questions based on information taken directly from the wound care instructions (Table 1). The next section of the survey consisted of three questions designed to test the subject's satisfaction and compliance with wound care instructions. For the purposes of this study, compliance was defined as having cleaned the wound at least once each day with hydrogen peroxide or commercial soap. The last question identified the type of instructions received by the patient or guardian. Telephone follow-up was considered unsuccessful when the patient had no telephone, the chart listed a wrong number, or there was no answer after three attempts.

Statistical Analysis

Patient demographics, disposition, and length of stay in the ED were obtained from the ED medical record. All data were stored in an epidemiologic database (EpiInfo, USD Inc., Stone Mountain, GA) for retrieval and statistical analysis. Chi-square analysis and unpaired t-tests were used, where appropriate, to determine significant differences between the two treatment groups.

WOUND CARE INSTRUCTIONS



■ FIGURE 1. Cartoon instructions for patients with lacerations (above and facing page).

Data were expressed as mean \pm SD unless otherwise noted. A p-value < 0.05 was considered significant.

■ RESULTS

Of the 400 eligible patients, 234 patients (parent or guardian if the patient was <14 years of age) were successfully contacted by telephone three days after ED release. We were unable to contact a large number of eligible subjects (42%), generally because of inaccurate information given during ED registration. When the 166 patients unavailable for data collection were compared

with the remaining sample population ($n = 234$), no significant difference was found in subject demographics, times spent in the ED, or levels of treating physician (resident vs attending).

No patient or parent refused the interview. Approximately 12% (29/234) of the patients or parents contacted did not read their instructions after leaving the ED and were excluded from further analysis. Seven percent (2/29) of these excluded patients had received instructions with cartoons; 93% (27/29), without cartoons ($p < 0.001$).

Table 2 lists the baseline characteristics of the 205

DRESSING CHANGES

TWICE A DAY:
 WASH INJURY WITH SOAP AND WATER OR 3% HYDROGEN PEROXIDE USING COTTON SWABS OR STERILE DRESSINGS. NEXT YOU MAY APPLY A THIN LAYER OF ANTIBIOTIC OINTMENT (BACITRACIN, NEOSPORIN, ETC.). RE-APPLY STERILE DRESSING FOR FIRST 2 DAYS AND THEN AS NEEDED TO PROTECT WOUND. REPLACE DRESSING IF IT BECOMES WET.



COMPLICATIONS

IF YOUR WOUND BECOMES
RED, SWOLLEN,
 SHOWS **RED STREAKS,**
 OR PUS, OR BEGINS TO HURT MORE
 INSTEAD OF LESS AS DAYS GO BY,
 HAVE IT CHECKED BY A DOCTOR.



SCARRING

ALL WOUNDS SCAR. THE FINAL APPEARANCE OF A SCAR CANNOT BE JUDGED UNTIL AT LEAST 6 MONTHS. SUNSCREEN APPLICATION TO THE INJURED AREA FOR THE FIRST 6 MONTHS WILL LESSEN THE EXCESSIVE COLORATION AND LESSEN THE VISIBILITY OF THE SCAR.



patients remaining in the study population. The overall mean age was 20.6 ± 19.8 years; 70% of the population were male. There was no significant difference in age, gender, level of education, time spent in the ED, or satisfaction with the ED visit between the two treatment groups.

Table 3 shows the results of the telephone survey. The patients or families given cartoon instructions were more likely to be "very satisfied" with their instructions (97% vs 66%), to find the instructions "very easy to read" (98% vs 64%), and to answer all wound care questions correctly (46% vs 6%). The patients with car-

toon instructions also reported better compliance with daily wound care; 77% (79/103) cleaned their wounds at least once each day with hydrogen peroxide or commercial soap. In contrast, 54% (55/102) of those patients who received nonillustrated instructions cleaned their wounds each day.

Forty percent ($n = 81$) of the respondents interviewed were parents or guardians of children <14 years of age. The caregivers given cartoon instructions were more likely to be "very satisfied" with their instructions (93% vs 74%, $p = 0.05$), to find the instructions "very easy to read" (98% vs 56%, $p < 0.001$), to answer all wound

■ **TABLE 2** Study Group Characteristics

| | With Cartoons (n = 103) | Without Cartoons (n = 102) |
|----------------------------|-------------------------------|----------------------------------|
| Age of patient | | |
| 0–14 years | 42 (41%) | 39 (38%) |
| 15–40 years | 50 (48%) | 48 (47%) |
| >40 years | 11 (11%) | 15 (15%) |
| Gender—male | 73 (71%) | 70 (69%) |
| Race—white | 70 (68%) | 66 (65%) |
| Education of respondent | | |
| <High school | 28 (26%) | 29 (28%) |
| High school/college | 75 (74%) | 73 (72%) |
| Physician level | | |
| Resident | 53 (51%) | 59 (58%) |
| Faculty | 50 (49%) | 43 (42%) |
| Total time in ED (±SD) | 99 ± 43 min | 94 ± 39 min |
| Satisfaction with ED visit | | |
| Very satisfied | 91 (88%) | 88 (86%) |
| Somewhat satisfied | 7 (7%) | 10 (10%) |
| Not satisfied | 5 (5%) | 4 (4%) |

care questions correctly (69% vs 8%, $p < 0.001$), and to be more compliant with their children's daily wound care (88% vs 69%, $p = 0.07$).

Subset analysis of the respondents who had less than a high school education ($n = 57$) demonstrated similar differences between the two treatment groups. The recipients of cartoon instructions were more likely to be "very satisfied" with their instructions (96% vs 55%, $p < 0.001$), to find the instructions "very easy to read" (96% vs 59%, $p = 0.002$), to answer all wound care questions correctly (46% vs 0%, $p < 0.001$), and to be more compliant with daily wound care (82% vs 45%, $p = 0.008$).

■ DISCUSSION

Successful ED therapy is based on recognition of illness, a proper diagnosis, and compliance with the therapeutic plan. Although encountered frequently, the issue of ED patient compliance has not been studied in a rigorous fashion. However, the largest study of general ED patients showed a 26% overall compliance rate with referral recommendations.² Disturbingly low rates of compliance also have been documented for pediatric, psychiatric, and geriatric emergency services.^{9,14,15} Non-compliance with ED release instructions is of particular concern to metropolitan teaching hospitals in the United States.¹⁶ This ED population consists of high-frequency users characterized as a lower-income, poorly educated,

minority population residing in the inner city, with limited access to follow-up care and poor acculturation. They present with higher illness severity, with as many as 58% of urban poor ED patients' being hospitalized, and would benefit from increased educational efforts to improve compliance with physician instructions.¹⁷

Poor comprehension of instructions is often secondary to inadequacies of communication between the patient and the physician and is a major contributor to patient noncompliance. Hedges et al.,¹⁵ e.g., reported that the most common reason for noncompliance in elderly patients released from the ED was a poor understanding of the home care instructions. In another study of 217 patients consecutively released from an inner-city hospital, 23% evidenced no understanding of at least one component of their ED instructions.¹⁸ Not surprisingly, patients with low literacy scores were more likely to have poor comprehension of instructions. In 1993, Jolly et al.³ demonstrated that a significant proportion of ED patients were unable to understand common written instructions. They recommended that health care providers strive to simplify written information (e.g., use clear, short sentences) and to develop new methods for patient instruction.

Color illustrations or photographs to supplement learning have been a mainstay of teaching during elementary education. Since recent studies indicate that a large proportion of ED patients currently read at or below the sixth-grade level,^{3,15} it would seem reasonable that cartoon illustrations might be an effective method to convey health care information. Austin et al.¹⁹ recently reported that the addition of illustrations to instructions significantly improved patient comprehension. However, this improvement was mostly limited to patients with a twelfth-grade education or less.

In the current study, we contacted patients beginning three days after release from the ED to assess our patients' comprehension of and compliance with their instructions. Twelve percent (29/234) of the patients contacted admitted that they had not even read their instructions and were excluded from further analysis. The majority of these patients (93%) had received our standardized written instructions, suggesting that the cartoons enhanced the interest of the recipients. Of those who read their instructions, a significant difference in satisfaction was observed between the two treatment groups (97% vs 66% were "very satisfied"), again emphasizing the importance of visual representation of information. Interestingly, although the written and the cartoon instructions had the same text, the respondents given cartoons were more likely to rate their instructions "very easy to read" (98% vs 66%).

Compliance is a useful measurement of the effectiveness of ED release instructions. It demonstrates the

ability to acquire information and to use it for the patient's own benefit. Patients given cartoon instructions were better able to answer all wound care questions correctly (46% vs 6%) three days after their ED visits, and were more likely to follow daily wound care instructions (i.e., clean the wound at least once each day with hydrogen peroxide or commercial soap). Differences between the two treatment groups were even more pronounced for the 57 respondents who had less than a high school education.

Approximately 40% of our respondents were parents or guardians who were present during their children's visits to the ED. The care that a child receives at home for his or her illness is presumably dependent on parental knowledge of the child's treatment plan and follow-up. Because many children receive episodic health care in ED settings, the effectiveness of doctor-parent communication in this setting is of great concern. Grover et al.⁶ recently reported that despite standardized written instructions, many parents have difficulty recalling their children's follow-up appointments, medication names, and medication administration, after an acute visit to the ED. In contrast, we found that parents given cartoon instructions were more likely to have read the instructions, to answer all wound care questions correctly, and to be more compliant with their children's daily wound care.

■ LIMITATIONS AND FUTURE QUESTIONS

This study has several potential limitations. We were unable to contact a large number of eligible subjects after ED release, generally because of inaccurate information given during ED registration. In addition, because a selected population was studied, our results may not apply to patients from other institutions. One should distinguish the urban facility serving the undereducated poor without other medical resources from the suburban facility used predominately by the more educated upper socioeconomic classes with family physicians.² Most institutions, including our ED, provide a mixture of these two patient populations. Each patient population has distinct reasons for noncompliance, and the ratio of these populations varies for different EDs.

It is important to note that our assessment of whether patients read or did not read the instructions, or were compliant with wound care, was based on self-reported information. Patient responses to a telephone survey are subject to considerable bias because the subject perceives the need to tell the investigator what he or she wishes to hear. To minimize response bias, we used a concurrent, randomized control group and blinded the telephone interviewer to the type of instructions given to the patient.

■ TABLE 3 Results of the Telephone Follow-up Survey

| | With Cartoons (n = 103) | Without Cartoons (n = 102) | p-value |
|---|-------------------------------|----------------------------------|---------|
| Satisfaction with instructions | | | |
| Very satisfied | 100 (97%) | 67 (66%) | <0.001 |
| Somewhat satisfied | 3 (3%) | 33 (32%) | |
| Not satisfied | 0 | 2 (2%) | |
| Readability of instructions | | | |
| Very easy | 101 (98%) | 65 (64%) | <0.001 |
| Somewhat easy | 2 (2%) | 32 (31%) | |
| Not easy | 0 | 5 (5%) | |
| Wound care questions correctly answered | | | |
| 0-1 | 3 (3%) | 34 (33%) | <0.001 |
| 2-3 | 53 (51%) | 62 (61%) | |
| All 4 | 47 (46%) | 6 (6%) | |
| Compliance with daily wound care | 79 (77%) | 55 (54%) | 0.001 |

The topic of wound care was chosen for the availability of a well-defined large treatment group. These patients were routinely given standardized instructions. However, because lacerations are such a common injury, it is probable that a number of patients believed that they knew enough wound care information to manage their injuries without reading the instructions. In future studies, it would be interesting to compare similar treatment groups with respect to a less common illness or injury. For example, can cartoon instructions be extrapolated to other clinical problems in emergency medicine? This approach may have advantages in treatment given to non-English-speaking patients.

This study did not address the additional costs of patient care (or other administrative or logistic problems) if illustrated instructions are to be implemented on a wide-scale basis. Our cost for reproducing a single two-page colored instruction sheet was approximately 40 cents. Finally, additional research is needed to determine whether illustrated instructions measurably improve clinical ED patient outcomes. Our study suggests that they positively affect patient satisfaction.

■ CONCLUSION

Providing patients with health care information that is easily readable and in a format that encourages reading presents a challenge to EPs. Our results suggest that cartoon illustrations are an effective strategy for conveying information and may improve patient compliance with ED release instructions.

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