Effect of Team Training on Patients' Ability to Complete MRI Examinations

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Rationale and Objectives: Assess whether staff training in advanced rapport skills and self-hypnotic relaxation techniques reduces noncompletion rates during magnetic resonance imaging (MRI).

Methods and Materials: All staff of a free-standing MRI facility was invited to 3 hours of preparatory communication lectures. Half of the practice was then engaged in intensive training. Clerical personnel and nonlicensed health care professionals received training in advanced rapport skills only (8 hours); licensed health care professionals were trained in advanced rapport skills plus rapid hypnotic techniques (17 hours). Content was adapted so that no interruptions of workflow would become necessary. The format included lectures, large group discussions, small group practice, and a microteaching exercise.

Results: During the quarter of operation before the training 1.2% (80 of 6,654) of patients could not complete their studies. After training, 0.74% (52 of 7,008) patients did not complete their scans ($P < .01$). Noncompletion rates of scans on the open magnet, on which the most anxious patients were scheduled, decreased from 3.43% (37 of 1,078 patients per quarter) to 1.45% (19 of 1,098). After staff was informed that the MRI partnership would be dissolved and personnel might be transferred or laid off, the noncompletion rate increased again, although not to the original levels; then, after partial dismantling of the facility, leveled off to 0.92% overall and 1.84% on the open magnet. Success was maintained at 1-year follow-up.

Conclusion: Team training in advanced rapport skills and self-hypnotic relaxation techniques significantly reduces MRI noncompletion rates. Personnel distress can adversely affect the patient experience.

Key Words: MRI; hypnosis; anxiety; claustrophobia; education.

Magnetic resonance imaging (MRI) can provide exquisite anatomic detail but fails when preexisting pain, claustrophobia, or panic from physical confinement and loud noise make it impossible for patients to remain still on the examination table. Estimates are that an average of 2.3% of patients is unable to complete their scan and obtain a diagnosis (1). This not only complicates the patients' subsequent care, but also poses a considerable burden on the imaging facility when the suddenly opened time slot cannot be filled without delaying subsequent patients and reimbursement is lost.

Prior studies in radiology departments showed that patients' pain and anxiety during invasive procedures can be reduced by rapid hypnotic techniques provided to patients without prior preparation (2–4). In these studies, the hypnotic interventions were structured by specially trained personnel while the patients were prepared for their interventions on the procedure table. Based on this experience, we came to hypothesize that the medical personnel already present in MRI facilities should be able to reduce noncompletion rates. We were able to test this hypothesis when asked by a large free-standing MRI facility to design a program that would result in the reduction of the rate of claustrophobia-caused noncompletion of MRI examinations. The rationale was mainly economic: to reduce revenue loss incurred with patients who cannot undergo or complete examinations and to gain a competitive advantage by providing exceptional attention to patient comfort, especially those with claustrophobic issues. The program objective was to train an entire team in interpersonal skills and mind-body techniques. This approach was intended to permit a streamlined procedure from the moment a patient calls for an appointment to the performance of the scan. This article describes how the request developed and how the project fared from the initial concept of need to execution and 1-year follow-up.

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MATERIALS AND METHODS

Determination of Need and Search for Options

The requesting facility was a joint venture of two community hospitals, which, in spite of their competitive relationship,

partnered to provide MRI exams close to home for area patients. The six-magnet, three-site practice included two mobile units for inpatients and one open magnet, to which claustrophobic patients often self-referred, or were scheduled if they expressed anxiety about possible claustrophobia. All patients were offered mirrors enabling them to see out of the magnet, earplugs for sound suppression, headphones for listening to music, blindfolds, and the option to be accompanied by an appropriately screened person. Patients who were not able to complete their exams could reschedule and ask their referring physicians to prescribe antianxiety medication, necessitating that the patient be given a ride to and from the exam. The free-standing sites' licensing prohibited intravenous conscious sedation. Although the practice enjoyed lower than industry average claustrophobia-caused noncompletion rates, the slots that did not produce completed exams still represented significant lost revenue. Because the outcome data were purely of financial and quality concern, without patient or trainee identifiers, and collected in the facility irresponsive of the study, institutional review board approval was not required.

Survey polls of 10 competing area MRI groups revealed that all were employing the same supports the requesting practice already offered. Some had open magnets; all referred claustrophobic patients to their own physicians for sedative medications if needed.

MRI personnel's search for alternative comfort measures turned first to traditional hypnotherapists, who, in spite of having enjoyed considerable success helping patients achieve certain therapeutic goals—smoking cessation or weight control, for example—could not envision adapting hypnosis to the requirements of the fast-paced MRI practice. A literature search led to research where teaching hypnotic nonpharmacologic analgesia to hospital radiology staff appeared the most readily applicable to the MRI environment (5,6). The services of this research physician were engaged to train the MRI staff.

Course Design

Training was performed in February and March 2007. The course design was based on prior experiences with teaching radiology staff and residents in nonpharmacologic analgesia (6,7). The methods had been validated in their ability to reduce patients' anxiety and pain in two large prospective randomized trials: one conducted during interventional radiology procedures and one during large core breast biopsies (2,3). The training consisted of two elements: an intensive advanced rapport module and a self-hypnotic relaxation component. All techniques were designed to be applied within the regular flow of work, without personnel having to invest extra time and without need for any prior patient screening, preparation, or hypnosis experience. Because this concept requires the health care provider to establish a very rapid understanding of patients' needs and customize the approach, heavy emphasis was based on instant rapport skills that were a staple of the hypnotic and therapeutic work of Milton Erickson, the "father" of American hypnosis (8). Taken in themselves, these rapport skills had also successfully been used for the training of radiology residents in interpersonal and communication skills in an Accreditation Council for Graduate Medical Education training module (9) and seemed suitable for the MRI practice as described under Teaching Content.

Great care was taken to make the training a communal effort, including all professional groups of the practice from the receptionists to the technologists, nurses, doctors, and practice chief. In several meetings with the administration, a strategy was developed to ensure that all stakeholders would have some input and have their concerns considered. Two kickoff meetings of 1.5 hours each familiarized all the staff with the planned activities and introduced rapport skill training that complemented preexisting "Communication Days" education in the facility. Videos were shown illustrating hypnotic interventions during procedures and pertinent literature was distributed.

The goal was to train the entire staff in two waves to permit continued clinical operations, even with part of the staff absent for training. The first wave consisted of about half of the full-time staff and included one registered nurse, one technologist-supervisor, eight radiology technologists, two receptionist/schedulers, and two client services staff members. The first training session took place on a Friday afternoon and evening and the following Saturday. Then trainees were given 4 weeks of opportunities to apply what they had learned in the first session when interacting with their patients and through access to a website with electronic teaching components. A second session followed, again on a Friday afternoon and Saturday. All training was done onsite, permitting the trainees to practice on an unscheduled scanner. This also helped the faculty to adapt the course content to the specific challenges and work flow of the practice.

Three trainers (one physician and two psychologists) provided a total of 17 classroom hours in addition to the previously mentioned initial 3 hours of introductory lecture given by the physician. This permitted adaptation to the 20 hours suggested hypnosis teaching standards of the American Society of Clinical Hypnosis. Licensed health care professionals received the entire 20 hours of training; the receptionist-schedulers were trained in advanced rapport techniques and received a theoretical overview of hypnosis, but were not trained in hypnotic techniques and did not participate in the second weekend session.

The format included lectures, large group discussions, small group practice, a computer-based module for self-practice, and a microteaching exercise to foster reflection and feedback (9). During this latter exercise, trainees were videotaped during practice of a skill they wanted to explore and improve within a small peer consulting group. They then reviewed the videotape, which had been obtained during their skill practice. Their group formulated feedback that was given after trainee and group reunited in a combination of self-assessment and group discussion.

Teaching Content

Intensive training in advanced rapport skills included following skills: building confidence, during which the practitioner learns to trust his or her abilities to learn and apply what has been learned; validating the patient by acknowledging the patient's current state of mind; adapting to the patients' preferred modes of verbal and nonverbal communication by emphasizing the sensory categories of the patient's preferred mode of perception (eg, visual, auditory, kinesthetic; understanding closeness-distance relationships by not backing away from patients who seek closeness and not on insisting on moving in on those who do not; decoding eye contact and movement to avoid misinterpretations based on the practitioner's own biases; attentive listening by backtracking and avoidance of interruptions; correct use of suggestions by avoiding negative words such as "hurt," "bad," and "panic button" and replacing with them with such neutral or positive words as "sensation," "comfort," "interesting," or "call button"; providing perception of control by asking what can be done for the patient; permissive choice of language such as "you might" rather than "do;" pacing and leading to a more resourceful state; and use of encouragement as opposed to praise by emphasizing the patient's contribution ["thank you for holding still"] rather than focus on the person ["you are a great patient"]).

The hypnosis segment explained the components of hypnosis: explanation of its nature, induction, deepening, use of ideomotor signals, reorientation, and posthypnotic suggestions if needed. The training familiarized students with various modes of induction and extensive practice with a variety of scripts, managing distress and pain, use of metaphors, and ego-strengthening exercises.

Follow-up Activities

A series of follow-up activities and communications from management was rolled out in the months after training to reinforce newly acquired skills and to provide the trainees with a support system for getting questions answered and conferring about difficult cases. Messages from management confirmed the importance of the hypnosis program and positive expectations about its financial and other benefits. A description of new behaviors (especially word choices that avoided negative suggestions such as "hurt" and "panic") was posted in the control room of each magnet to orient and inform the as-yet-untrained personnel. As follow-up activities, trainees adapted their hypnosis scripts according to their preferences and experiences, sought each others' alternative suggestions for wording on their scripts, and prepared skits for a staff meeting education segment to demonstrate the contrast between their pretraining and posttraining behaviors.

Assessment of Noncompletion Rates of Scans

The facility's finance and quality control systems tracked patients who could not complete their scans. The facility considered those to be claustrophobia-related, but it cannot be excluded that some patients may have ended their scans because of pain, but this is not known. There were no contrast reactions accounting for noncompletion. Considering that the training was undertaken largely as a measure to improve efficiency, the exact cause and type of claustrophobia was not further explored in the statistics. Quarterly statements compiled the number of scans performed on all six scanners, with rates also monitored separately for each scanner.

Claustrophobia-caused noncompletion rates from the quarter before training were compared to the quarter after the training and at 1-year follow-up by two-sided chi-square tests at a significance level of $P < .05$.

RESULTS

During the quarter of operation before the training, 1.2% (80 of 6,654) of patients could not complete their studies because of claustrophobia. After training half of the staff, only 0.74% (52 of 7,008) patients did not complete their scans ($P < .01$). Noncompletion rates of scans on the open magnet, on which the most anxious patients were scheduled, decreased from 3.43% (37 of 1,078 patients per quarter) to 1.45% (19 of 1,098 patients per quarter). An overview of the noncompletion rates at the various canners is given in Table 1.

Before the second wave could be trained, the joint venture partners decided to dismantle the practice in the third quarter of 2007 when it became apparent that hospital-owned imaging services would receive more favorable insurance reimbursement. With senior management absorbed in transition planning, encouragement of trainees dwindled. Staff members became anxious about the future of their jobs because it was not clear to which of the partner hospitals—or at all—they would be transferred. In the 3 months after announcement of the dissolution of the practice, the noncompletion rate increased to 1.13% (77 of 6,798 patients per quarter) overall and 3.04% (33 of 1,085 patients) on the open scanner. The transition plan specified a multiphase process, wherein licenses and staff were distributed to the two hospitals in stages. After the transition plan was communicated to staff and the remaining personnel knew their job dispositions, the claustrophobia noncompletion rate decreased again and steadied overall at around 0.93% overall in the following two quarters (61 of 6,582 and 66 of 7,209 patients per quarter). On the open scanner, where now only one of the trained individuals remained with two untrained new colleagues, noncompletion rates decreased to 2.14% (23 of 1,075) and 1.84% (20 of 1,086) in the subsequent two quarters. The decrease in noncompletion rate was still significant in the April to June 2008 quarter for the open scanner ($P = .0208$). During the 1-year follow-up visit, the remaining trainee on the open scanner reported having had no patients who could not complete their visits; all noncompletion cases with this scanner occurred during the shifts of the two untrained colleagues also assigned to the scanner. Of note

TABLE 1. Noncompletion Rates in Percent of Patients Imaged on the Individual Scanners

Scanner	Pretraining	Q1 Patients	Q2 Patients	Q3 Patients	Q4 Patients	Q5 Patients
1	1.96	0.51	0.89	0.52	0.96	
2	0.76	1.02	0.85	1.08	0.92	1.02
3 (open)	3.43	1.45	3.04	2.78	2.14	1.84
4	0	0.10	0.10	0.33	0.72	0.38
5	1.39	0.64	0.65	1.20	0.42	0.82
6	0.44	0.53	0.31	0.78	0.45	0.28
8						1.40
All scanners	1.33	0.74	1.13	1.18	0.93	0.92

Scanner #3 is the open magnetic resonance imaging scanner. Scanner #1 was taken out of service in the fifth quarter (Q5) after training. Its license was transferred to Scanner #8, a 3T magnet.

also is that more patients who identified themselves as anxious were scheduled to be examined on the closed magnets according to feedback from the schedulers. There are unfortunately no data that indicate the extent of this occurring. This in part accounts for fluctuations in the noncompletion rates at these different sites shown in Table 1.

When viewing Table 1, which compares the noncompletion rates among the individual scanners, it also has to be taken into account that some patients who, before the training, would have been scheduled on the open scanner because of their indication of possible anxiety were given more often the opportunity to be scheduled on the closed scanner with the higher resolution images after training. Thus more anxious patients may have been presented at these sites than before training. There was, however, no tracking of how often this was happening and the exact content of this is not known.

DISCUSSION

This study demonstrated that team training in advanced rapport skills and hypnotic techniques can successfully reduce claustrophobia noncompletion rates. The original plan to train the remaining staff unfortunately was derailed when the MRI joint venture was dissolved. This course of events, however, also might afford insight on how concerns about job security and future workplace disruption might adversely affect the staff's ability to project behavior that is helpful for the patient. Adverse transference of staff emotion on patients' anxiety levels and physiology has also been demonstrated in a study with percutaneous tumor embolizations (4).

Particularly in the early stages after training, it is important to encourage the trainees to use their new skills repeatedly to develop sufficient confidence in applying the techniques learned. At the 1-year follow-up it, was remarkable to see to which degree the remaining trainees had developed this confidence, often based on situations in which they had to step up to manage a particularly challenging patient and where "there was nothing more to lose." These kinds of challenges with the immediate positive patient feedback proved to be a reward in itself, which stimulated their personal investment in continuing to employ hypnosis. The sheer number of patients presenting in the facility on a daily basis permitted the trainees to fine tune their skills as is only possible with continued repetition towards a level of mastery (10). At the time of the 1-year follow-up, the trainees had continued to build their skill levels by adapting the original training content to their specific practice environment in a process enhanced by immediate positive patient feedback. Mutual support among the trainees in managing particularly difficult cases further cemented their enthusiasm and pride in their success, making external incentives for continuation of the practice less important.

One may wonder whether training of a few individuals offsite at a hypnosis training class may have yielded similar success. Introducing new behaviors for management of patients' distress touches the very foundation of "caring" among providers and tends to be shaped more by institutional norms than patient needs (11,12). For example, there is a widely held belief that negative suggestions such as "This won't hurt that much" provide the patient a better experience, although there are no data to support this assumption and there are data that show that such statements increase actually pain and anxiety (13). It thus becomes very difficult for team members on their own to introduce new behavioral techniques if the remainder of the team is not on board. This concurs with our prior training experiences in the interventional and breast biopsy setting and emphasizes that it indeed "takes a village" with mutual support to obtain quick traction and avoid sabotage. One may speculate that this might have been easier in a commercial rather than academic environment where, at least at the time of the study, considerations for bottom-line performance were more ingrained in the culture.

An analysis of the literature between 1980 and 1993 indicated anxiety-related reactions in 4%–30% of patients undergoing MRI ranging from apprehension to inability to complete the test (14). Dewey et al calculated a from a series of studies up to 2004 an average claustrophobia noncompletion rate of 2.3% with a 95% confidence interval (CI) of 2.0%–2.5% (1). In their own study with a conventional MRI scanner, the authors' noncompletion rate was between 2.1% in a group of 42,998 patients and 2.3% in a group of 12,736 patients. In this context, the initial overall

claustrophobia noncompletion rate of 1.2% in the MRI facility in this study was relatively low reflecting the efforts administration had already invested in a patient-centered approach and soothing architectural environment.

Solutions in the literature to combat claustrophobia, in addition to the techniques already mentioned in the methodology, range from scanning prone (15) to providing music (16) to use of new scanner designs. Dewey et al found a reduction in claustrophobia caused noncompletion rates from 2.1%–2.3% down to 0.7% (95% CI 0.6%–0.9%) when patients were scanned in a recently developed scanner with 97% acoustic noise reduction and a short bore (1). This reduced level compares well with the effect the team training had in our study.

Many centers use sedation to help patients complete MRI examinations. Murphy et al report that 14.3% of 939 patients in their university-based facility received either oral sedatives, intravenous conscious sedation, or general anesthesia. This did not include patients who may have used sedatives without knowledge of the physician before arrival (17). Eshed et al provided intravenous sedation to 1.97% of 5,798 patients to treat claustrophobia; this adjunct resulted in an overall 1.22% noncompletion (18). In a study comparing nasal midazolam spray with placebo in patients with comparable anxiety levels and characteristics, 4 of the 27 patients inhaling NaCl could not complete their scans as compared to none of 27 in the midazolam group (19). Moreover, the image quality was significantly better in the sedated group ranging from good to excellent as compared to that in the placebo group where quality ranged between very poor (not usable) to good. This shows that the effects of untreated distress are not limited to noncompletion but may also increase the risk of inaccurate interpretation and, thus, liability. In addition, the negative experience may also lead patients to refuse future MRI examinations, excluding them from the diagnostic accuracy of this noninvasive and radiation-free modality (17).

When medical sedation is used, patients require additional observation; serious side effects can occur even with relatively low doses (20). Biobehavioral techniques are, therefore, an attractive option. Quirk et al interviewed MRI patients about their experiences: many patients combated anxiety on their own by using breathing and relaxation techniques, visualizing pleasant scenes, and performing mental exercises (21). It thus would seem natural to help patients further their ability to use such techniques. Quirk et al then also showed that a 12-minute relaxation exercise reduced patient anxiety during MRI scanning (22). However, there were obstacles to implementing mind-body techniques more broadly in practice. A statement Klonoff et al made in 1986 remained valid for a long time: that behavioral techniques for use during radiologic procedures, including MRI, have received surprisingly little attention even in the behavioral community (23). The main impediments were early beliefs that such techniques are best provided by mental health professionals and that traditional hypnotic techniques and desensitization approaches just took too long for a busy practice. This belief has changed since it has become apparent that rapid hypnotic techniques can be used without interruption of workflow, that they actually save time and money, and that personnel already present can perform them quite expertly (2,5,7). Team training extends this concept one step further in making such services available around the clock.

Charge rates for MRI studies during the time of the study differed among insurance carriers and between outpatient centers versus hospital-based facilities, and ranged between $750 and $5,000 with varying reimbursement rates. For this practice, training amortized in less than a quarter with sustained effects from capturing a higher volume of completed scans. Additional savings not quantified resulted from a reduced need to reschedule or repeat sequences. The enhanced ability to relax patients also permitted greater flexibility in scheduling because more patients could complete their examinations on one of the five closed scanners with reservation of the open scanner for very claustrophobic or obese patients.

Although the original incentive of the practice was primarily economic, the experience can serve as a model for outcomes assessment of education. An improvement in clear patient-based metrics implies that trainees have learned and assimilated skills and continue to practice and refine them in their daily work. We conclude from the study that team training in advanced rapport skills and self-hypnotic relaxation techniques results in improved patient outcome and more effective practice of medicine.

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