RESEARCH ARTICLE

A Magic Therapy Program to Alleviate Anxiety in Pediatric Inpatients

Harrison D. Pravder, BA,[a] Amanda Leng-Smith, BA,[a] Andrew I. Brash, BA,[a] David J. Elkin, MD,[a] Michael Attard, MA, CCLS,[b] Brooke Rose, MA, CCLS,[b] Catherine R. Messina, PhD,[c] Maribeth B. Chitkara, MD[a,d]

ABSTRACT

OBJECTIVES: Hospitalization generates increased psychological discomfort for children and their caregivers. This anxiety can affect the patient-caretaker response to the health care team and the course of treatment. We aim to evaluate the impacts of a magic therapy program, organized and facilitated by medical students, on alleviating pediatric inpatient and caregiver anxiety.

METHODS: Patients aged 5 to 16 years admitted to an inpatient pediatric unit and their caregivers were eligible for inclusion. Patient-caregiver pairs were randomly assigned to a magic therapy intervention group or a control group. Anxiety was measured before and after the intervention by using validated self-report tools. The Facial Image Scale and Venham Picture Test were used to measure anxiety for young patients, the short State-Trait Anxiety Inventory and Facial Image Scale were used for older patients, and the short State-Trait Inventory was used for caregivers. A subset of the intervention group was reevaluated at 1 hour posttherapy. Health professionals were also surveyed regarding their opinions of the program.

RESULTS: One hundred patients and 90 caregivers were enrolled. The patient magic group's standardized anxiety was reduced by 25% ($n = 47$; $P < .001$) posttherapy. The caregiver magic group's anxiety was reduced by 24% ($n = 34$; $P < .001$). Data suggest that anxiety reductions lasted through at least 1 hour posttherapy. Physicians ($n = 9$), nurses ($n = 8$), and pediatric residents ($n = 20$) supported program continuance, reported favorable impressions, and suggested patient, caregiver, and staff benefits.

CONCLUSIONS: Integration of a magic therapy program into pediatric inpatient care was feasible and successful in decreasing patient and caretaker anxiety. Health care professionals support the program's continuance.

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Address correspondence to Harrison D. Pravder, BA, Renaissance School of Medicine, Stony Brook University, 50 Cedar Dr, Great Neck, NY 11021. E-mail: harrison@magic-aid.org

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Deidentified individual participant data (including data dictionaries), in addition to study protocols, the statistical analysis plan, and the informed consent form, will be made available. The data will be made available on publication to researchers who provide a methodologically sound proposal for use in achieving the goals of the approved proposal. Proposals should be submitted to Harrison Pravder at harrison@magic-aid.org

[c]*Department of Family, Population, and Preventive Medicine and* [a]*Department of Pediatrics, Renaissance School of Medicine, Stony Brook University, Stony Brook, New York; and* [b]*Child Life Program and* [d]*Department of Pediatrics, Stony Brook Children's, Stony Brook, New York*

Pediatric patients struggle with an onslaught of fears and concerns on hospitalization regardless of acuity.[1] These reactions can be attributed to a host of factors, including new environments, receiving unfamiliar investigations and treatments, separation from family and friends, and loss of self-determination. Similar increased anxiety levels can be seen in the parents of hospitalized patients whom children rely on as a source of stability.[2,3] It is vital to develop tools to promote effective coping strategies for children and caretakers during a child's hospitalization period.

Humor therapy has been proposed as a tool to help patients and caretakers cope with stressors related to medical experiences,[4] such as preparing for hospitalization or surgery[3,5] and managing pain.[6] Magic therapy, an interactive humor- and illusion-based therapy, engages children in an activity to help them overcome medical challenges by establishing a sense of environmental control and improved self-esteem through mastery. A magic therapy session for the child includes enjoying a brief, interactive "magic show" followed by learning how to perform a trick and receiving a magic prop to practice with and use to perform for others.[7]

The use of magic in the clinical setting has been described as a physical therapy modality, a communication aid, a psychotherapy tool, occupational and/or dexterity training, and humor therapy.[8] Project Magic is an example of a popularly recognized magic therapy program implemented in 1981 by the magician David Copperfield and Julie DeJean, an occupational therapist, to teach patients magic tricks to enhance their well-being, motivation, and self-esteem.[9] The Breathe Initiative is another program that uses a 2-week summer magic camp designed as a physical therapy modality to help children with hemiplegia.[10] The Healing of Magic program aims to help patients in long-term rehabilitation regain physical skills, motivational levels, and self-esteem through simple magic tricks.[11]

Our magic therapy curriculum, MagicAid, was conceived at our institution in 2014 as a preclinical medical student interest group to introduce students to clinical care and provide magic therapy for pediatric patients.[7] It has since developed into a medical student–founded nonprofit organization that trains health sciences students and medical professionals, most of whom are new to magic, to deliver 1-on-1 magic therapy for patients and their families. At our institution, it is used both in scheduled "magic rounds" and by request of the health care team or patients. All student magic therapists attend 2 1-hour sessions to learn about magic therapy and practice techniques in addition to outside practice. This program has trained >200 student "magic therapists" and interacted with >1000 patients at our center since its founding.

Studies of magic-based interventions to improve health outcomes and the patient experience are lacking, with no known controlled research evaluating magic therapy in a hospital setting.[9,11,12] In this study, we performed a randomized controlled investigation evaluating the therapeutic benefit of MagicAid magic therapy during an inpatient hospitalization. Our goals were to determine (1) the efficacy of magic therapy services in relieving pediatric patient and caretaker anxiety, (2) the perceived reception of the therapy by pediatric patients, and (3) the opinions of health professionals regarding the use of the therapy.

METHODS

Subjects

The study was performed on the general pediatric ward at a university-based children's hospital. Children in the unit were eligible if they were 5 to 16 years old and consented to participate. Written consent was given by the caregiver, and written assent was given by children older than age 11. All caregivers of enrolled patients were eligible for inclusion if they were present with the children during the hospitalization. Medical professionals, including nurses, resident physicians, and attending physicians, were eligible for inclusion if they worked in the unit. Subjects were excluded if they did not understand the English language or had significant cognitive or visual disabilities.

The study protocol was approved by our institutional review board before recruitment.

Study Groups

After a baseline anxiety survey, patients and their caregivers were randomly assigned to 1 of 2 study groups: (1) a magic intervention group that received 1 magic therapy session or (2) a control group that did not receive magic therapy.

In the intervention group, medical student magic therapists who completed MagicAid training provided therapy ∼15 minutes after the baseline assessment.[7] The student performed 3 to 4 magic tricks ("effects") for the patient that catered to the patient's age and cognitive capability. Patients were then taught to perform 1 of these effects that was best suited to them, as determined by the student. For example, an 8-year-old child may learn the classic "ball-in-vase" effect. After learning an effect, the patient was given the associated magic prop to keep for future practice and performances of their own. Follow-up anxiety surveys were administered within 3 minutes of the conclusion of the magic therapy session.

The control group had no magic or other interventions. The follow-up survey was administered ∼30 minutes after the baseline survey; there was no interaction with study personnel between the baseline and follow-up surveys. Caregivers reported the demographic information of all subjects.

Anxiety Evaluation Instruments

Three anxiety evaluation tools were used to quantify the anxiety of patients and caregivers: the Venham Picture Test (VPT), Facial Image Scale (FIS), and short State-Trait Anxiety Inventory (STAI). The younger patient population (5–10 years old) was evaluated with pictorial scales, the VPT and the FIS. The older patient group (11–16 years old) was assessed by using the FIS and STAI. The caretaker group was assessed by using the STAI. All scales were presented to subjects immediately after consent was given (T1) and within 3 minutes (T2) of completing therapy (intervention group) or ∼30 minutes after consent was given (control group), and both groups had approximately the same wait time from T1 to T2. A subset of the intervention group

received a second follow-up survey ~1 hour after therapy (T3).

VPT

The VPT is a validated measure of state anxiety in pediatric patients aged >2 years.[13–15] The test consists of a series of 8 cards, each consisting of 2 child figures, 1 "anxious" and 1 "nonanxious." Subjects were shown the cards in a predetermined numerical order and asked to point to the figure that they felt like most at the time. If the child pointed at the anxious figure, a score of 1 was recorded; if the child pointed at the nonanxious figure, a score of 0 was recorded. The final score was the sum of recorded values.

FIS

The FIS is a validated measure of anxiety in patients aged 3 to 18 years.[15] The test comprises a row of 5 faces ranging from "very happy" to "very unhappy." Subjects were shown the 5 faces and asked to point to the figure that they felt like most. If the child pointed at the most positive effect face, a score of 1 was recorded; if the child pointed to a more negative affect face, a score of up to 5 was recorded.

STAI

The STAI is a 6-item validated measure of anxiety in subjects aged 5 years and older.[16,17] Subjects were asked to rate how they felt on a 4-point Likert scale in relation to feeling calm, tense, upset, relaxed,

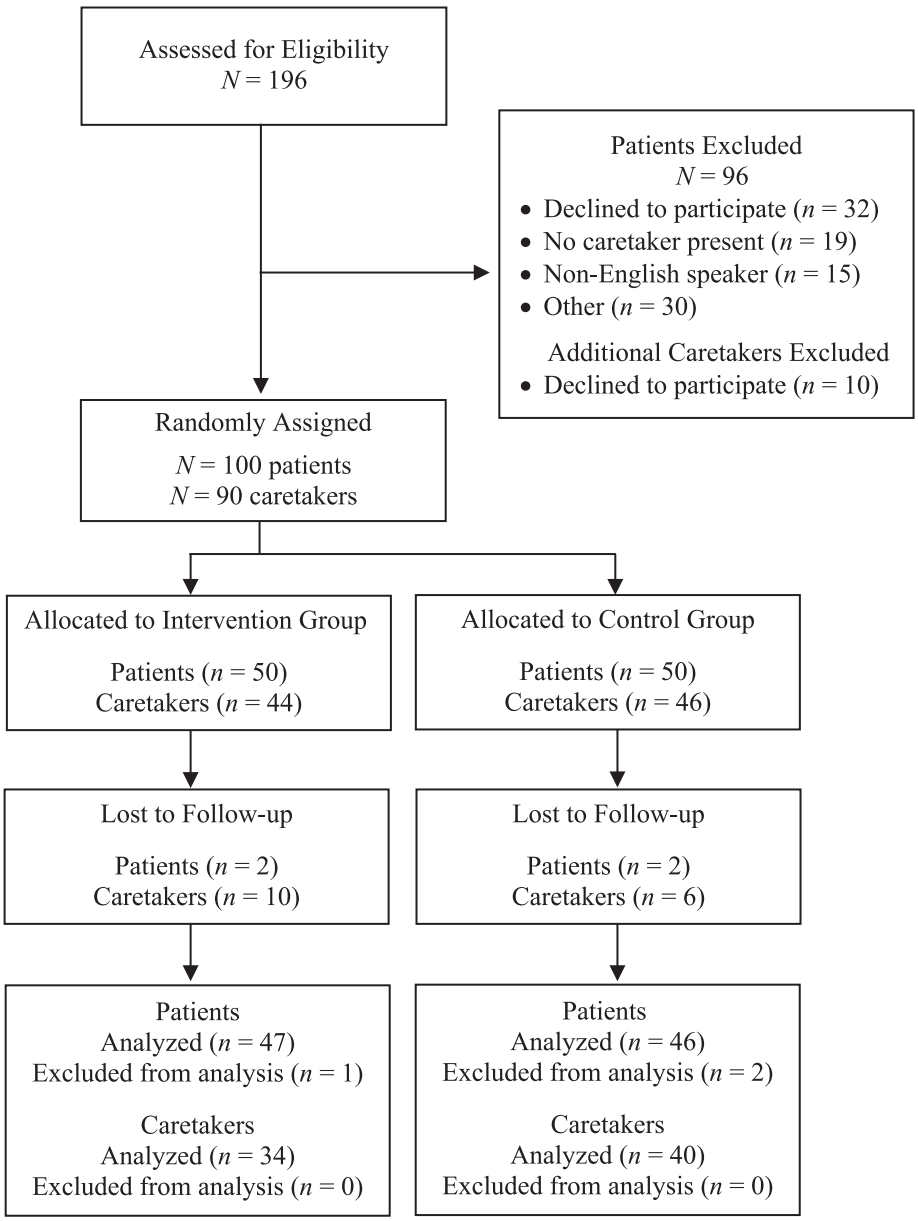

FIGURE 1 Study flow diagram.

content, or worried. A score of 1 correlated to "not at all" and a score of 4 correlated to "very much." The final score was the sum of recorded values.

Therapist Self-Evaluation Form for Patient Reception

Student magic therapists completed a form[5] after their interaction with the subject, evaluating the child's reaction in 4 categories: looking interested, participating, reacting positively, and smiling. The score is on a scale of 1 to 5. A final score was calculated by the sum of recorded values (maximum of 20; minimum of 4).

Questionnaire for Health Professionals

A questionnaire[5] was used to obtain health care providers' opinions on the usefulness of magic in reducing anxiety and the feasibility of such a program in a health care setting. Nurses present during therapy for the first week of the study were asked to enroll. If so, they were consented and surveyed. Attending pediatricians in the Division of Pediatric Hospital Medicine and resident physicians present during a resident program meeting within the study period were surveyed.

Data Analysis

Descriptive statistics were obtained for all study variables. Categorical data were compared by using the χ^2 test of association. Continuous data were compared by using *t* tests for independent or paired samples as appropriate. Self-reported anxiety is reported as a standardized anxiety score, which was calculated for each subject at each time point and presented in addition to individual survey findings. Anxiety scores were calculated by normalizing each survey score to a maximum value of 1 and determining the mean at each time point.

The general linear regression model for repeated measures (GLR) approach evaluated percentage differences in self-reported state anxiety measured at baseline and at follow-up among children and caretakers. The between-subjects factor was study group (magic intervention versus control). Relevant child (age, sex, previous hospitalizations, and psychiatric diagnoses) and caretaker (age and sex) covariates were controlled for. Covariate outliers were defined as 3 times the SD and excluded. The coefficient *t* statistics and their corresponding *P* values were used for significance measurements. A paired *t* test between the baseline survey (T1) and second follow-up (T3) was used to evaluate differences in self-reported anxiety between the 2 periods. All tests of significance were 2 sided, specified before recruitment, and evaluated at $P < .05$.

Subgroup analyses (patients at first hospitalization versus those with previous experiences; patients with psychiatric diagnoses versus those with no diagnoses) were conducted by using the GLR for percentage differences between baseline (T1) and follow-up (T2). All statistical analyses were conducted by using IBM SPSS Statistics 25 (IBM SPSS Statistics, IBM Corporation).

RESULTS

A total of 196 patients aged 5 to 16 years and their caregivers were assessed for eligibility (Fig 1). Ninety-six potential subject patient-caregiver pairs and an additional 10 caregivers were not included because they met exclusion criteria or declined to participate. One hundred patients and

TABLE 1 Subject Characteristics

Characteristics	Control	Intervention	*P*
Patient total, *n* (%)	46 (51)	47 (49)	—
Age, y, *n* (%)			.46
5–10	26 (57)	23 (49)	
11–16	20 (43)	24 (51)	
Female sex, *n* (%)	19 (41)	28 (60)	.08
Psychiatric diagnosis,[a] yes, *n* (%)	8 (17)	8 (17)	.96
Length of stay, d, mean ± SD	2.1 ± 1.7	1.6 ± 1.1	.07
Previous hospitalizations, *n* (%)			.85
0	36 (78)	36 (77)	
1–3	10 (22)	11 (23)	
4+	0	0	
Caretaker total, *n* (%)	40 (54)	34 (46)	—
Age, y, *n* (%)			.11
18–29	3 (8)	1 (3)	
30–39	13 (33)	18 (53)	
40–49	15 (38)	14 (41)	
50–59	8 (20)	1 (3)	
60+	1 (3)	0 (0)	
Female sex, *n* (%)	32 (80)	27 (79)	.95
Marital status, *n* (%)			.11
Single, never married	4 (10)	9 (26)	
Divorced or separated	4 (10)	1 (2)	
Married	32 (80)	24 (71)	
Race and/or ethnicity, *n* (%)			.36
African American	3 (8)	2 (6)	
Hispanic	8 (20)	2 (6)	
Asian American	2 (5)	2 (6)	
White	26 (65)	25 (74)	
Other	1 (3)	3 (9)	

Categorical comparison was established by means of the χ^2 test. Numerical comparison was established by means of an independent sample *t* test. —, not applicable.

[a] Anxiety, attention-deficit/hyperactivity-disorder, or depression.

TABLE 2 Anxiety Parameters at Preintervention, Postintervention, and 1 Hour Follow-up

	Preintervention (T1), Mean ± SD		Postintervention (T2) Mean ± SD (%)			Follow-up (T3), Mean ± SD (%)		
	Control	Intervention	Control	Intervention	P^a	Control	Intervention	P^b
Patient parameters								
FIS	2.00 ± 0.91	2.28 ± 0.84	1.96 ± 0.85 (+7)	1.42 ± 0.61 (−31)	<.01	—	1.83 ± 1.19 (−17)	.34
STAI	10.64 ± 3.92	12.44 ± 4.41	9.62 ± 3.20 (−5)	9.44 ± 2.68 (−20)	.01	—	8.00 ± 1.16 (−20)	.04
VPT	0.85 ± 1.12	1.21 ± 1.82	1.08 ± 1.29 (+24)	0.52 ± 0.99 (−18)	.06	—	0.63 ± 0.92 (−25)	.30
Anxiety score	0.33 ± 0.17	0.40 ± 0.21	0.31 ± 0.15 (+7)	0.25 ± 0.13 (−25)	<.001	—	0.26 ± 0.16 (−14)	.18
Caretaker parameter, STAI	12.43 ± 4.43	14.50 ± 4.46	12.17 ± 4.46 (−2)	10.63 ± 3.30 (−24)	<.001	—	12.63 ± 5.85 (−14)	.17

Percent changes represent differences from preintervention averaged across individual subjects. —, not applicable.
[a] Significance value of the study group percentage change coefficient in a linear regression test from T1 to T2.
[b] Significance value of a paired *t* test between T1 and T3.

90 caretakers remained and were randomly assigned to the control ($n = 50$ patients and 46 caretakers) or intervention group ($n = 50$ patients and 44 caretakers).

There were no differences with respect to patient age, sex, mental health diagnosis, or number of previous hospitalizations or caregiver age, sex, marital status, or race between the control and intervention groups (Table 1).

Patient Anxiety

There were no significant differences in baseline FIS, VPT, STAI, or standardized scores between the control and intervention patient groups (Table 2). All survey methods detected significant percentage decreases in preintervention (T1) to postintervention (T2) measures (average: −23%; range: −18% to −31%) within the magic intervention group. The intervention standardized anxiety score detected a decrease in anxiety of 25%, a decline that was significantly different from that of the control group ($P < .001$). A GLR (Supplemental Tables 5) reported that the between-group coefficient (control versus intervention; coefficient = −0.320; $P < .001$) contributed more significantly to the observed differences than similarly analyzed covariates (sex, age, psychiatric diagnosis, and previous hospitalization visits; coefficient range: −0.034 to 0.098; *P* range: .148–.669), suggesting that the primary factor for the decline in reported patient anxiety was the study group to which the subject was assigned.

The intervention subsample undergoing a third follow-up (T3) at an extended time point ∼1 hour after therapy suggested maintained anxiety reduction. The standardized anxiety score was reduced 14% from baseline at this time ($P = .18$; $n = 13$), suggesting the potential for a beneficial effect on anxiety from the therapy lasting ∼1 hour after the interaction.

Subgroup analyses (Supplemental Table 6) were conducted to evaluate patients who were hospital naïve (no previous hospitalizations; $n_0 = 36$; $n_1 = 36$) versus hospital experienced (previous hospitalizations; $n_0 = 10$; $n_1 = 11$) and patients with no psychiatric diagnosis ($n_0 = 38$; $n_1 = 39$) versus those with a formal diagnosis ($n_0 = 8$; $n_1 = 8$). In the hospitalization experience GLR, the study group factor (assignment to control versus intervention group) contributed the most to the model and was the only statistically significant contributor. In the psychiatric diagnosis analysis, no analyzed covariates significantly contributed in differences between the control and intervention group.

Caretaker Anxiety

There were no differences with respect to baseline STAI between the control and intervention caretaker groups (Table 2). A decrease in anxiety was observed in the intervention caretaker group from baseline to first follow-up (−24%), whereas the reported anxiety in the control group remained near baseline levels (−2%). A GLR reported that the between-group coefficient (control versus intervention; coefficient = −0.224; $P < .001$) was more responsible for observed differences than were similarly analyzed covariates (sex, age; coefficient range: −0.013 to 0.082; *P* range: .125–.611).

The caregiver subsample undergoing a third follow-up (T3) ∼1 hour after magic therapy suggested maintained anxiety reduction at this time point. The standardized anxiety score was reduced 14% from baseline to the third follow-up survey ($P = .17$; $n = 13$), which is consistent with the general trend seen in the patient intervention group.

Patient Reception

An assessment of the student magic therapist intervention was conducted in the intervention group only. We report the descriptive statistics (Table 3) that represent an average interaction score of 18.29 out of 20.00 among all patient intervention interactions.

Health Professional Questionnaire

The reports of health professionals are reported in Table 4. This sample was composed of attending physicians, resident physicians, and registered nurses ($n = 37$). Roughly half of those surveyed reported having observed a magic therapy session. They reported a belief that the activity is helpful for the child (81%), parents (57%), and staff (47%). Furthermore, 97% reported

TABLE 3 Efficacy of Interaction With Student Magic Therapist

Variable	Mean ± SD
The child	
Looked interested	4.40 ± 0.81
Participated	4.62 ± 0.75
Reacted positively	4.67 ± 0.56
Smiled	4.60 ± 0.78
Total	18.29 ± 2.54

TABLE 4 Results of Questionnaire for Health Professionals

	Result
Observed medical student magician, %	
Yes	51
No	49
View of student magicians in patient's room, %	
Very favorable	57
Favorable	35
Indifferent	8
Contrary	0
Very contrary	0
The magic activity is useful for the	
Child, %	
Yes	81
No	3
I do not know	16
Parents, %	
Yes	57
No	24
I do not know	19
Staff, %	
Yes	47
No	33
I do not know	19
Favorable to continue the activity in patient rooms, %	
Yes	95
No	5
The student magicians are a disturbance, %	
Yes	0
No	97
Sometimes	3

that the student magicians were not a disturbance in the health care setting, and 95% recommended continuance of the program.

DISCUSSION

In the pediatric population, a hospitalization experience creates a constant environment of uncertainty and stress.[1] The unfamiliar setting is also emotionally challenging for the caregiver, who often experiences increased anxiety with their child's admission for reasons such as uncertainty relating to their medical condition[18] and financial costs.[19,20] The importance of addressing the uncomfortable nature of a hospitalization for all participants makes this area of investigation vital for potentiating maximal well-being and ease of treatment for the health care team. Our study is the first to evaluate the impact of magic therapy on anxiety reduction in hospitalized patients and their caregivers.

The results of this study show that magic therapy significantly reduces inpatient pediatric anxiety in the immediate time period after therapy and suggests an extended time benefit ~1 hour after therapy (Table 2). Magic therapy significantly reduced anxiety in caregivers with a similar suggested benefit to that of patients ~1 hour after therapy. Others have evaluated other therapeutic modalities under similar circumstances to alleviate the stressors of hospitalization. Alparslan and Bozkurt[21] found that medical clowns present during hospitalization cause a significant decrease in child state anxiety and no decrease in parent anxiety during hospitalization. Kazemi et al[22] reported that playing the music of Johann Sebastian Bach significantly decreased the anxiety of pediatric inpatients. Art[23] and pet therapies[24] have also been described as effective modalities.

Another investigation focused on clowns in the perioperative setting found a reduction in pediatric anxiety during induction of anesthesia but reported that a majority of medical staff were not in favor of continuing the intervention because it was viewed as interfering with the operating room routine.[5] We used the same survey to ask the staff about how our magic therapy fits with the flow of the hospital setting. In contrast to the results of the medical clown investigation, 97% of those surveyed said that the magic therapists were not a disturbance, and 95% recommended continuance of the program. Although we evaluated our therapy on an inpatient floor rather than in an operating room, these results suggest that magic therapy may be better tolerated by hospital staff than medical clowns. The potential reasons for this difference are wide ranging. We believe that because our providers are medical students (with a basic understanding and interest in health care) they are able to assimilate better to the environment. Medical clowns typically come from a performance background, which may be received poorly by medical staff.

Staff members were also surveyed on who they thought the therapy was useful for: patient, parents, and/or staff (Table 4). These survey questions were intended to serve as an additional gauge of the impact of therapy based on individuals who have been in direct contact with those interacting in magic therapy. A majority of staff reported that they believed magic was helpful for the child (81%) and parent (57%), and many also reported that they believed it was helpful for the staff (47%). These results are an encouraging reminder that many staff believe the therapy is helpful. This component is highly important because buy-in from staff will facilitate the implementation of this therapy in the clinical setting.

Our study stands as a starting point for the investigation of magic therapy in the hospital setting. The study design sought to investigate our program's concept and reception by all involved. In these areas, we conclude that our program was highly successful. However, the design also affords several limitations. Our study only included those on a general inpatient floor. The typical length of stay on this floor is 2 to 3 days, and medical state is good to fair. As such, our results do not fully translate to other units (such as ICUs) or longer-term units (such as chemotherapy centers), although we would expect similar outcomes. Further study in these settings could shed light on different applications of magic therapy. Moreover, we evaluated the impacts of our therapy several minutes after therapy and ∼1 hour after therapy. These time points were chosen to specifically detect short-term benefits. We believe this model can be used to assess short-term anxiety reduction in other settings, from simple intravenous insertion to the perioperative environment. Lastly, our caregiver groups had a large drop-out rate, creating a potentially self-selected sample. This occurrence was due to several caregivers not being present during therapy. Although present in both the control and intervention groups, it may have introduced a source of bias. Given the promising reception of the program and its positive impact on pediatric inpatient and caregiver anxiety levels, we advocate for the continued study of magic-based therapies within the hospital setting and encourage investigations comparing the benefits of magic therapy to those of other performing arts, such as clowning or music.

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