Does structured informational care reduce anxiety in patients undergoing MRI? A quasi-experimental study

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Abstract

Objective: To assess the anxiety level in patients undergoing magnetic resonance imaging, and to see if structured informational care reduces anxiety compared to conventional approach.

Method: The quasi-experimental study was conducted at Dow Institute of Radiology, Dow University of Health Sciences Karachi, Pakistan from January 2020 to June 2021, and comprised of adult patients of either gender undergoing magnetic resonance imaging of brain / cervical spine for the first time. They were divided into S-arm group exposed to structured information with pictures, recordings and videos, and C-arm group exposed to conventional information. The primary outcome was anxiety, measured by Beck Anxiety Inventory. Data was analysed using SPSS 11.

Results: Of the 280 subjects, 140(50%) were in the S-arm; 65(46.4%) males and 75(53.6%) females with mean age 41.1±15.2 years. The C-arm had 140(50%) subjects; 78(55.7%) males and 62(44.3%) females with mean age 44.2±13.9 years ($p>0.05$). The pre-procedure anxiety score of C-arm was 11.3±7.7 compared to 9.6±7.7 in S-arm ($p=0.062$. Post-procedure anxiety score in S-arm was 9.8±9.0 compared to 1.49±4.5 in C-armB ($p<0.001$).

Conclusion: Structured informational care aimed at familiarising the patient to the magnetic resonance imagaing machine and describing the relaxing manoeuvres during examination was found to be a cost-effective and simple method to alleviate anxiety in patients.

Keywords: Claustrophobia, Premature termination, Magnetic resonance imaging, Anxiety, Structured informational care. (JPMA 73: 1436; 2023) **DOI: https://doi.org/10.47391/JPMA.7347**

Submission completion date: 08-08-2022 - **Acceptance date:** 23-02-2023

Introduction

Magnetic resonance imaging (MRI) has been described by leading internists as the most significant clinical advancement in the last 25 years.[1] During an MRI scan, one of the important hindrances is anxiety that usually occurs in claustrophobic patients. Severe anxiety has been reported in 15% people undergoing MRI examination.[2] The incidence is higher in females.[3] Anxiety results in compromised examination either due to motion blur, or respiration or swallowing movement, leading to image degradation, making interpretation difficult.[4] Approximately two million scans end in premature termination per year worldwide.[5] Ultimately, it leads to wastage of expensive resources in terms of time, budget and manpower, and increases financial burden on healthcare systems,[6] specially in developing countries like Pakistan.

Anxiety during MRI examination is attributed to various factors, like unfamiliarity with the procedure, small tube

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dimensions of MRI machines, and the machine's loud noise. If a patient is already in pain or discomfort, and worried about what MRI may detect, the level of anxiety increases exponentially, and it further gets aggravated by the waiting time in the radiology section.[7] Various interventions to control such factors have been tried worldwide to overcome the anxiety level, like written information, prior training, cognitive techniques and self-hypnotic relaxations.[8-10] Cognitive therapy can help in the reduction of anxiety.[11] However, the major limitations to these interventions relate to resources (time, cost, mock MRI), protocols and expertise (need for an indwelling psychologist for cognitive therapy).[12] One remedy to all these limitations in a resource constrained environment is structured informational care through pictures, recordings, videos, and it has reported significant reduction in anxiety in patients undergoing MRI.[13]

The current study was planned to assess the anxiety level in patients undergoing MRI, and to see if structured informational care reduces anxiety compared to the conventional care approach.

Subjects and Methods

The quasi-experimental study was conducted at Dow Institute of Radiology, Dow University of Health Sciences Karachi, Pakistan from January 2020 to June 2021. After

approval from the institutional ethics review board, the sample was patients aged 18 years or above who had been referred to the radiology department for MRI brain/cervical spine, and who were undergoing MRI for the first time. Patients taking anti-hypertensive, anti-anxiety, anti-depression drugs or had known hyperthyroidism, contrast allergy, neurological disorder or mentally incapacitated were excluded from the study.

After taking informed consent from the subjects, the study was conducted in two separate phases (Figure), with each phase lasting eight months.

Phase-I related to conventional informations care, or the C-arm in which the technician carried on the conventional departmental protocol, which included ensuring the patient was in loose and comfortable clothes; no metallic objects were attached to the body; verbal description was given about the procedure, like closed space machine, 15-20 minutes duration and machine sounds; instruction to use the buzzer in case of anxiety; and reassure the patient that if anxiety persisted, the procedure will be terminated prematurely. This was followed by the MRI procedure.

Phase-II related to structured informational care, or the S-arm. In addition to the C-arm procedure, structured informational care specifically compiled with the help of pshyciatrists was provided. This included a video of MRI machine on laptop to familiarise the patients with the machine sound; counselling of the patient to try different techniques to alleviate anxiety, like deep breathing, imagining a place where the person feels happy and comfortable, counting, keeping the eyes closed, recalling the happy memories of the past; and music or recitation of Holy Quran to be turned on if requested. This was followed by the MRI examination.

In both phases, MRI examination was performed on closed bore magnetic imaging (1.5 Tesla GE Signa) systems, and anxiety level was assessed pre-MRI and post-MRI.

Anxiety was measured using the Beck Anxiety Inventory (BAI)[14] which is a freely available and validated self-assessment tool. All questions are scored on a rating scale 0-3; with 0=no anxiety and 3=severe anxiety. Data was collected by students of Bachelors in Science, who were trained by a psychiatrist to understand and interpret the BAI form as well as to provide the structured informational care. The patient was asked to fill in the form and a researcher was there to help with language barriers or understanding difficulty.

The total score was calculated from the reported answers and final interpretation was done, with score 0-21=mild
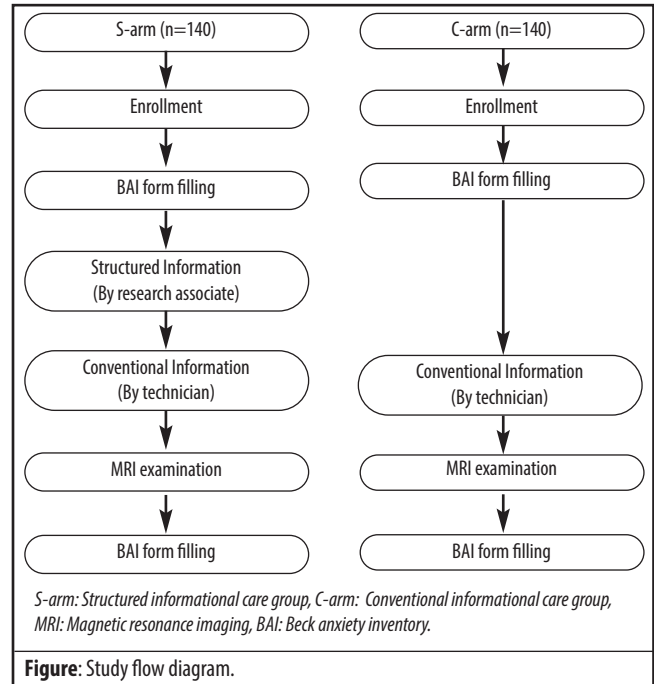

S-arm: Structured informational care group, C-arm: Conventional informational care group, MRI: Magnetic resonance imaging, BAI: Beck anxiety inventory.

Figure: Study flow diagram.

anxiety, 22-35=moderate anxiety; and >35 = severe anxiety.

The sample size of 140 patients was calculated using OpenEpi calculator[15] with confidence level of 95%, margin of error 8%, and reported anxiety level in literature 37%.[16]

Data was analysed using SPSS 22. Mean and standard deviation were calculated for variables like age and BAI score. Frequencies and percentages were calculated for gender, marital status, residence, educational status, occupation, religion, premature termination of procedure and presence of anxiety. C-arm and S-arm values were compared using independent sample t-test if the data had normal distribution on Shapiro-wilk test. Intragroup comparison was done using McNemar test. P<0.05 was considered statistically significant.

Results
Of the 280 subjects, 140(50%) were in the S-arm; 65(46.4%) males and 75(53.6%) females with mean age 41.1±15.2 years. The C-arm had 140(50%) subjects; 78(55.7%) males and 62(44.3%) females with mean age 44.2±13.9 years (p>0.05). The pre-procedure anxiety score of C-arm was 11.3±7.7 compared to 9.6±7.7 in S-armA (p=0.062. Post-procedure anxiety score in S-arm was 9.8±9.0 compared to 1.49±4.5 in C-armB (p<0.001) (Table 1).

There was higher conversion from moderate to mild level of anxiety in the S-arm (Table 2).

Discussion
Patients in the S-arm experienced less anxiety than those in the C-arm, and the reduction in overall anxiety score was

Table-1: Baseline and outcome variables between the groups.

Variable	Conventional Care (n=140)	Structured Information Care (n=140)	*p*-value
Mean Age (years)	44.2±13.9	41.1±15.2	0.077
Male Gender	78 (55.7%)	65 (46.4%)	0.15
Education level			0.86
None	9 (6.4%)	12 (8.6%)	
Primary	12 (8.6%)	11 (7.9%)	
Secondary	50 (35.7%)	53(37.9%)	
Higher	69 (49.3%)	64 (45.7%)	
Pre-procedure score	11.3±7.7	9.6±7.7	0.062
Post procedure score	9.8±9.0	1.49±4.5	<0.001
Pre-procedure anxiety			0.822
Mild	126 (90.0%)	128 (91.4%)	
Moderate	12 (8.6%)	11(7.9)%	
Severe	2 (1.4%)	1 (0.7%)	
Post-procedure anxiety			0.049
Mild	130 (92.9%)	138(98.6%)	
Moderate	8 (5.7%)	1 (0.7%)	
Severe	2 (1.4%)	1 (0.7%)	
Anxiety Difference			<0.001
No difference	18 (12.9%)	21 (15%)	
Reduced	78 (55.7%)	110 (78.6%)	
Increased	44 (31.4%)	9 (6.4%)	

Table-2: Intra-group comparison of pre-procedure and post-procedure anxiety level.

Convetional information care group.

	Post Procedure Anxiety			Total
	Mild	**Moderate**	**Severe**	
	n (%)	n (%)	n (%)	
Anxiety on arrival				
Mild	120 (95.2)	5 (3.9)	1 (0.79)	126
Moderate	10 (83.3)	2 (16.7)	0	12
Severe	0	1 (50)	1 (50)	2
Total	130	8	2	140
Structured informational care group.				
Anxiety on arrival				
Mild	127 (99.2)	0	1 (0.8)	128
Moderate	10 (90.9)	1 (9.1)	0	11
Severe	1 (100)	0	0	1
Total	138	1	1	140

significantly associated with conversion from moderate to mild level of anxiety in the S-arm.

The findings can be attributed to multiple reasons, like the structured information provided to the S-arm patients prior to the scan, cognitive therapy in the form of simple instructions, orientation to the scanning environment, and proactive description of relaxing manoeuvres during the scan to overcome anxiety. Moreover, the research associates were trained by a psychiatrist, increasing the validity of the findings.

The current results corroborated the findings of other national and international studies.[17-19] Nakarada-Kordic et al.[20] compared virtual reality (VR) tool, a mobile application, to familiarise the patient with the MRI experience, with mock MRI and found both interventions having equivalent effect in reducing procedure-related anxiety. Hence, mobile applications can be a very cost-effective tool in the modern age of social and electronic media.

In the current study, there was no significant difference of anxiety stratified according to gender, which is contradictory to earlier studies that reported higher anxiety in females due to claustrophobia.[16,21] In the current study, significant anxiety difference in various age groups was not observed, similarly other studies have also reported that anxiety occurs in almost all age groups, ranging 20-80 years.[16,21] The strength of the current study is that it had a quasi-experimental design and was conducted in two phases in order to yield unbiased results. Randomisation in both the study arms could have introduced information bias due to contamination effect caused by patients sharing the pictures, videos and knowledge in the waiting area, and technicians adopting S-arm gradually and managing both the arms in the same way. This would have led to a net flow of knowledge from S-arm to C-arm and reduction in anxiety due to contamination effect, or differential misclassification.

The current study has a few limitations. First, the sample size was too small to allow generaliation of the findings. Second, it did not study individually which component of the structured care was more efficient in reducing anxiety. In order to achieve a homogenous set of participants, only plain brain and spine MRI cases were chosen at the cost of generalisability. Future research should study other factors affecting the level of anxiety, like patient diagnosis, patient personality, and pain due to the primary condition. Another limitation of the study is that it included only adult patients.

Based on the current findings, it is recommended that pamphlets and videos related to MRI procedure should be available in the waiting area.

Conclusion

The use of structured informational care aimed at familiarising the patient to the MRI machine and the procedure as well as describing the relaxing manoeuvres during the examination was found to be a cost-effective and simple method to alleviate anxiety in patients.

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