Research Article

A Pre-Experimental Study to Assess the Effectiveness of QR Code Information on Knowledge Regarding Post-Operative Care of Patients with Craniotomy among Caregivers in Selected Hospitals of Pune City

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Abstract

Introduction: Craniotomy is a major neurosurgical procedure performed to access the intracranial cavity for treatment of tumors, trauma, hemorrhage, and other neurological conditions. Proper post-operative care is essential to prevent complications and promote recovery. Caregivers play an important role in supporting patients after discharge, but many caregivers lack adequate knowledge regarding home care, medication management, wound care, nutrition, and recognition of complications. Digital educational tools such as QR code-based information provide a simple and accessible method for delivering health education.

Aims of the study: To assess the effectiveness of QR code information on knowledge regarding post-operative care of patients with craniotomy among caregivers in selected hospitals of Pune city.

Methodology: The present study aimed to assess the effectiveness of QR code information on knowledge regarding post-operative care of patients with craniotomy among caregivers in selected hospitals of Pune city. A quantitative pre-experimental one-group pre-test and post-test design was used. 100 caregivers were selected using a non-probability purposive sampling technique. Data were collected using a structured knowledge questionnaire. Reliability of the tool was established by Karl Pearson's method (r = 0.9876).

Result: The findings showed that before intervention, 63% of caregivers had poor knowledge, while after the QR code intervention, 58% achieved good knowledge scores. The mean pre-test score was 8.66 and post-test score was 16.14. Statistical analysis demonstrated a significant improvement in knowledge (t = 12.4033, p = 0.001). The study concluded that QR code-based information was effective in improving caregivers' knowledge regarding post-operative care of craniotomy patient

Conclusion: The study revealed that most participants had poor knowledge regarding the post operative care of the patient with craniotomy . However, after the QR Code information intervention, the majority demonstrated good knowledge, confirming the effectiveness of the method. No significant association was found between demographic variables and knowledge levels, suggesting that the intervention was beneficial among care givers.

Keywords: Craniotomy, Caregivers, QR Code Information, Post-Operative Care, Knowledge, Neurosurgery

Introduction

Craniotomy is a neurosurgical operation in which a bone flap is temporarily removed from the skull to access the intracranial space. Craniotomies are often critical operations performed for a range of conditions, including tumors, hemorrhages, and removal of foreign bodies such as bullets.[1]

Craniotomy is distinguished from craniectomy (in which the skull flap is not immediately replaced, allowing the brain to swell, thus reducing intracranial pressure) and from trepanation, the creation of a burr hole through the cranium into the dura mater.[1]

Craniotomy is performed for a variety of diagnostic and therapeutic purposes. Its function is to provide temporary surgical access to the intracranial space. Neoplastic lesions: resection or biopsy of primary or metastatic brain tumors. Trauma: elevation of depressed skull fractures; extraction of penetrating intracranial foreign bodies. Intracranial hemorrhage: evacuation of epidural, subdural, or intracerebral hematomas.[2]

Infection: drainage and washout of abscesses or empyemas. Vascular lesions: clipping of intracranial aneurysms; treatment of arteriovenous malformations or fistulas; microvascular decompression for trigeminal neuralgia or hemifacial spasm. Open revascularization procedures: extracranial–intracranial bypass; encephalo duro arteriosynangiosis (EDAS).[3]

Epilepsy and functional neurosurgery: cortical resection; lesionectomy; implantation of deep brain stimulation electrodes. Cerebrospinal fluid–related procedures: repair of CSF leaks; creation of CSF shunts; endoscopic third ventriculostomy (ETV); fenestration of arachnoid cysts. Skull base or cranial nerve decompression: resection of skull base tumors such as vestibular schwannoma or meningioma; decompression of cranial nerves.[4]

A craniotomy is the surgical removal of part of the bone from the skull to expose the brain. Specialized tools are used to remove the section of bone called the bone flap. The bone flap is temporarily removed, then replaced after the brain surgery has been done. Some craniotomy procedures may use the guidance of computers and imaging to reach the precise location within the brain that is to be treated.[5]

Need for the Study

Craniotomy is one of the most frequently performed major neurosurgical procedures worldwide. Large epidemiological studies from developed countries report that the global incidence of craniotomy ranges between 12–25 procedures per 100,000 population per year, depending on hospital facilities and case mix.[6]

A U.S. nationwide database study documented an annual incidence of 15–17 craniotomies per 100,000 population, mainly for trauma, tumors, and hemorrhage. Similarly, a European analysis involving multiple neurosurgical centers found the incidence to be 12–20 per 100,000 population, with significant variation across regions due to differences in access to neurosurgical services. In the United Kingdom, national statistics showed an annual incidence of approximately 13.5 craniotomies per 100,000 populations, with head injury and tumor surgeries contributing the highest proportion.[7]

Craniotomy involves greater morbidity and mortality and has a wide variety of complications. These complications may be avoided by careful perioperative planning, strict adherence to aseptic technique, meticulous microsurgical dissection, proper wound closure, the judicial use of prophylactic agent, and proper wound care. The incidence of craniotomy surgery and its complications are high in united states and also in India. The lack of personal hygiene, lack of adequate knowledge of patients and caregivers are the important factors in developing most of the complications such as pneumonia, DVT, wound infection and bleeding disorders.[8]

Complications of craniotomy include seizures, Hemiplegia or hemiparesis, infection, stroke, DVT, pulmonary embolism, and may lead to permanent brain damage. The majority of survivors return back to home to reside in community with various physical, psychological, emotional, social and spiritual health disabilities after the initial period of hospitalization and rehabilitation. These disabilities are preventing the patient from functioning independently and effectively in the community.[9\]

Aim of the Study

"A Pre-Experimental Study to Assess the Effectiveness of QR Code Information on Knowledge Regarding Post-Operative Care of Patient With Craniotomy Among Care Givers in Selected Hospitals of Pune City".

Objective

1. To assess the knowledge regarding post-operative care of patient with craniotomy among care givers before intervention.
2. To assess the knowledge regarding post-operative care of patient with craniotomy among care givers after intervention.
3. To determine the effectiveness of QR code information on knowledge regarding post-operative care of patient with craniotomy among care givers.
4. To associate the knowledge with the selected demographic variables.

Materials and Methods

Objectives of the Study

1. To assess the pre-test knowledge regarding postoperative care of patients with craniotomy among caregivers.
2. To assess the effectiveness of QR Code information on knowledge regarding postoperative care of patients with craniotomy among caregivers.
3. To determine the association between knowledge scores and selected demographic variables.

Research Approach: A quantitative research approach was adopted to assess the effectiveness of QR Code information on knowledge regarding postoperative care of patients with craniotomy among caregivers in selected hospitals of Pune City.

Research Type: Pre-experimental research study.

Research Design: A pre-experimental one-group pre-test–post-test research design was employed.

Research Setting: The study was conducted in selected hospitals of Pune City, Maharashtra.

Study Population: Caregivers of patients who had undergone craniotomy in selected hospitals of Pune City.

Sample and Sample Size: A total of 100 caregivers were included in the study.

Sampling Technique: A non-probability purposive sampling technique was used to select the participants.

Description of the Research Tool

A structured knowledge questionnaire was developed through literature review, expert consultation, and researcher experience to assess caregivers' knowledge regarding postoperative care of patients with craniotomy. The tool consisted of two sections.

Section I – Demographic Variables: Consisted of demographic information related to the caregivers.

Section II – Structured Knowledge Questionnaire: Consisted of questions assessing knowledge regarding postoperative care of patients with craniotomy.

Validity: Content validity of the research tool was established through expert review by nursing professionals from Bharati Vidyapeeth College of Nursing, Pune.

Reliability: Reliability was assessed using the test–retest method and Karl Pearson's correlation coefficient. The obtained reliability coefficient was r = 0.98, indicating high reliability.

Pilot Study: A pilot study was conducted among 10 caregivers to assess the feasibility and clarity of the research tool and study procedure.

Data Collection Procedure: A pre-test was conducted using the structured knowledge questionnaire, followed by administration of QR Code information regarding postoperative care of patients with craniotomy. A post-test was conducted after the intervention to assess improvement in caregivers' knowledge.

Ethical Considerations: Necessary permission was obtained from the concerned hospital authorities. Written informed consent was obtained from participants, and confidentiality was maintained throughout the study.

Statistical Analysis: The collected data were analysed using descriptive and inferential statistical methods to assess knowledge levels and evaluate the effectiveness of QR Code information.

Results

SECTION I: Demographic Profile of Participants

Demographic variables	F	%
1. Age (in years):		
a) 18–30	44	44
b) 31–45	**46**	**46**
c) 46–60	10	10
2. Gender:		
a) Male	48	48
b) Female	**52**	**52**
3. Educational Qualification:		
a) No formal education	18	18
b) Primary education	**33**	**33**
c) Secondary Education	22	22
d) Higher Secondary	20	20
e) Graduate	7	7
4. Relationship to the Patient:		
a) Parent	33	33
b) Spouse	**43**	**43**
c) Son/Daughter	17	17
d) Sibling	7	7
e) Other (specify)	0	0
5. Type of Family:		
a) Nuclear family	43	43
b) Joint family	**47**	**47**
c) Extended family	10	10
6. Duration of Caregiving for the Current Patient:		
a) Less than 1 week	40	40
b) 1–2 weeks	**53**	**53**
c) More than 2 weeks	7	7

1 Percentage wise distribution according to Age : The analysis of age distribution revealed that the majority of caregivers, 46% belonged to the 31–45 years age group. 44% were between 18-30 years, 10% belong to 46-60 years.

2)Percentage wise distribution according to Gender : The analysis of gender distribution showed that the majority of caregivers, 52%, were females and males 48 %.

3: Percentage wise distribution according to Educational Qualification : In terms of educational qualification, the highest proportion of participants had primary education 33%, secondary education 22% ,higher secondary 20% and graduate 7% and no formal education 18%.
4: Percentage wise distribution according to Relationship to the patient. The analysis of relationship to the patient revealed that the majority of caregivers, 43%, were spouses of the patients , parent is 33%, Son/Daughter 17% and Siblings 7% .
5: Percentage wise distribution according to Type of family. The analysis of type of family showed that the majority of caregivers, 47%, belonged to a joint family, Nuclear family is 43% and extended family 10 %.
6: Percentage wise distribution according to Duration of caregiver for the current patient. The analysis of duration of caregiving for the current patient revealed that the majority of caregivers, 53%, had been providing care for 1–2 weeks, less than one week 40% and more than two weeks 7%.

SECTION II (A): Pre-test and Post-test Knowledge Scores

Table No.2 - Related to assess the knowledge regarding post-operative care of patient with craniotomy among care givers before the intervention.
n=100

Level of pre test knowledge	F	%	Mean	SD
Poor (0-7)	**63**	**63**	8.66	3.97
Average (8-15)	30	30		
Good (16-22)	7	7		

• Poor knowledge was observed in 63% of participants
•Average knowledge was observed in 30 % of participant.
• Good knowledge was noted in 7% participants.
• The mean knowledge score was 8.66(SD = 3.97), indicating inadequate awareness before intervention.

SECTION II(B) - Related to assess the knowledge regarding post-operative care of patient with craniotomy among care giver after the intervention.
Table no.3 n=100

Level of Post test knowledge	F	%	Mean	SD
Poor (0-7)	4	4	16.14	4.54
Average (8-15)	38	38		
Good (16-22)	**58**	**58**		

• The mean post-test knowledge score improved to 16.14 (SD = 4.54), showing QR code information was effective in improving knowledge regarding post operative care of patient with craniotomy.

SECTION III - Related to compare the effectiveness of QR code information by comparing pre-test and post-test knowledge scores.

Table no.4 n=100

Effectiveness on QR code information on knowledge regarding post-operative care of patient	Mean	SD	DF	t value	p value	Remark
Pre Test	8.66	3.97	99	12.4033	0.001	Significant
Post Test	16.14	4.54	99			

The above table shows that the mean post-test knowledge score (16.14) was higher than the mean pre-test score (8.66) The mean knowledge score increased from 8.66(SD = 3.97) in the pre-test to 16.14(SD = 4.54) in the post-test, indicating a substantial rise in knowledge levels after the intervention.

The calculated t-value (12.4033) was statistically significant at p -value was < 0.001, which is statistically significant at the 0.05 level of significance.
Hence, the null hypothesis was rejected and research hypothesis is accepted, indicating that the educational intervention had a significant positive effect on the knowledge levels of caregivers.

SECTION IV : Find Associate the Pre-test Knowledge findings with the Selected Demographic Variables.

No statistically significant association was found between pre-test knowledge scores and demographic variables.
This indicates that QR Code information was equally effective among care givers.

Discussion

The present study was conducted to assess the effectiveness of QR code information on knowledge regarding post-operative care of the patients with craniotomy among caregivers in selected hospitals of Pune city. The findings of the study revealed that the QR code–based educational intervention was effective in improving the knowledge level of the caregivers. Before the intervention, most caregivers had inadequate knowledge regarding post-operative care. In the pre-test, 63% of caregivers had poor knowledge, 30% had average knowledge, and only 7% had good knowledge. The mean pre-test score was 8.66 (SD=3.97), indicating insufficient awareness regarding essential post-operative care practices.
After administration of the QR code information, a marked improvement was observed in the knowledge scores of the caregivers. In the post-test assessment, 58% of participants had good knowledge, 38% had average knowledge, and only 4% remained in the poor knowledge category. The mean post-test score increased to 16.14 (SD=4.54), demonstrating a substantial gain in knowledge following the intervention.
The effectiveness of the QR code intervention was further confirmed using a paired t-test. The calculated t-value was 12.4033 with a p-value of 0.001, which was a statistically significant at the 0.05 level. This indicates that the difference between pre-test and post-test knowledge scores was significant, proving that QR code information effectively enhanced caregivers' understanding of post-operative care of craniotomy patients. The study also analyzed the association between pre-test knowledge scores and selected demographic variables such as age, gender, educational qualification, relationship to the patient, type of family, and duration of caregiving. The findings revealed no statistically significant association between demographic variables and knowledge scores, as all p-values were greater than 0.05.
Overall, the study findings support that QR code–based educational information is an effective and innovative method for improving caregivers' knowledge regarding post-operative care of patients with craniotomy.

Conclusion

The present study assessed the effectiveness of the QR Code information on knowledge regarding post operative care of the patient with craniotomy among care givers in selected hospitals of Pune City. A total of 100 care givers were included in the study using non-probability purposive sampling technique, and a pre-experimental one-group pre-test post-test design was adopted.
The findings revealed a significant improvement in knowledge regarding post operative care of the patient with craniotomy after providing of the QR Code information. In the pre-test, 63% of participants had poor knowledge, 30% had Average knowledge,7% participants had Good knowledge. Following the intervention, 4% participants in the poor category, while 58% had Good knowledge and 38% achieved Average knowledge.
The mean knowledge score improved from 8.66 in the pre-test to16.14 in the post-test. The paired t-test showed a highly significant difference ($t = 12.4033$, $p < 0.001$), thereby confirming the effectiveness of the intervention.
The analysis also revealed that demographic variables not show any significant association with post-test knowledge scores. This indicates that the QR Code information was equally effective among care givers.

Conflict of Interest

We, researchers, understand that conflict of interest refers to situations in which financial or other personal considerations may compromise our judgment in evaluating, conducting, or reporting research. We hereby declare that we do not have any personal conflict of interest that may arise from our application and submission of our research proposal.

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