Preventive Medicine Reports 28 (2022) 101895

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: www.elsevier.com/locate/pmedr

Review article

Effectiveness of educational videos on patient's preparation for diagnostic procedures: Systematic review and Meta-Analysis

Ana Monteiro Grilo [a,b,*], Ana Catarina Ferreira [c], Marta Pedro Ramos [c], Elisabete Carolino [a], Ana Filipa Pires [c,d], Lina Vieira [a]

[a] H&TRC- Health & Technology Research Center, ESTeSL- Escola Superior de Tecnologia da Saúde, Instituto Politécnico de Lisboa, Av. D. João II, lote 4.69.01, Parque das Nações, 1990-096 Lisboa, Portugal
[b] CICPsi - Research Center for Psychological Science, Faculty of Psychology, University of Lisbon, Portugal
[c] Escola Superior de Tecnologia da Saúde, Instituto Politécnico de Lisboa, Av. D. João II, lote 4.69.01, Parque das Nações, 1990-096 Lisboa, Portugal
[d] Faculdade de Medicina Dentária, Universidade de Lisboa, Rua Professora Teresa Ambrósio, Cidade Universitária, 1600-277 Lisboa, Portugal

ARTICLE INFO

Keywords:
Educational video
Diagnostic procedures
Anxiety
Patient satisfaction
Systematic review
Meta-analysis

ABSTRACT

Although diagnostic procedures are crucial for secondary prevention and patient disease control, they often trigger fear and anxiety. These reactions highlight the need to adopt effective interventions to improve patients' experience and satisfaction. Recently, educational videos have been employed in preparing diagnostic procedures; however, there is no integrated understanding of their effects. This systematic review and *meta*-analysis aimed to assess the effectiveness of educational videos on patients' anxiety and satisfaction regarding preparation for diagnostic procedures. Three scientific databases (PubMed; Web of Science, Scopus), were used in this systematic review. Studies about educational videos as a form of preparation for patients undergoing diagnostic procedures published between 2000 and 2021 were included. A *meta*-analysis was also conducted. Sixteen studies met the inclusion criteria for systematic review, and seven were included in the *meta*-analysis. Nine studies of the total sample were about vascular procedures and seven studies about other medical image procedures. Of the fourteen studies that evaluated the use of educational videos on patients' anxiety, nine proved to reduce it significantly. Of the thirteen studies that evaluated satisfaction, seven showed a significant increase in the experimental group. Studies included in the *meta*-analysis show that educational video patient groups had lower anxiety levels than the control groups after the procedure. Although future studies are required, the results suggest that educational videos effectively prepare patients for diagnostic procedures, improving care quality.

1. Introduction

Nowadays, diagnostic procedures play an essential role in secondary prevention and patient disease control. Several situations resort to medical imaging, both in Nuclear Medicine [e.g., Positron Emission Tomography (PET)] and in Radiology [e.g., Magnetic Resonance (MRI), Computed Tomography (CT), Ultrasound (US), Angiography, and mammography], as these play a crucial role in early diagnosis, treatment decision, management, and surveillance of various diseases (Munn and Jordan, 2011).

Despite the great potential of the diagnostic procedures, it has been shown that these can trigger stress and negative emotional states such as anger, fear, and anxiety (Elboga et al., 2015; Pifarré et al., 2011; Karadeniz et al., 2008).

Psychological reactions before and during invasive and non-invasive procedures have been reported in different studies, varying from slight apprehension to severe anxiety (Elboga et al., 2015; Kutlutürkan et al., 2010). Anxiety is a normal response to an unwanted stimulus, promoting responses adapted to it. However, when experienced in excess, it can hamper the patient's ability to deal with the stress they are exposed to (Grilo et al., 2017). Anxiety caused by diagnostic procedures is recognized as a standard clinical concern in international cancer institutions (Bui et al., 2021; Coping with "Scanxiety" during and after Cancer Treatment, 2021).

* Corresponding author at: Escola Superior de Tecnologia da Saúde, Instituto Politécnico de Lisboa, Av. D. João II, lote 4.69.01, Parque das Nações, 1990-096 Lisboa, Portugal.
E-mail addresses: ana.grilo@estesl.ipl.pt (A. Monteiro Grilo), etcarolino@estesl.ipl.pt (E. Carolino), ana.jesus@estesl.ipl.pt (A. Filipa Pires), lina.vieira@estesl.ipl.pt (L. Vieira).

https://doi.org/10.1016/j.pmedr.2022.101895
Received 21 February 2022; Received in revised form 27 May 2022; Accepted 1 July 2022
Available online 5 July 2022

Several factors can generate anxiety in diagnostic procedures: a) the clinical situation of the patient; b) it being the first time the patient is submitted to the procedure; c) the procedure itself, where it has included many aspects, such as the medical procedures and the equipment itself, and d) concern about the results of the procedure (Vieira et al., 2021; Grilo et al., 2017; Abreu et al., 2017; Domènech et al., 2010; Shortman et al., 2015).

Previous studies have shown that providing adequate information, both before and after the exam, is directly associated with patient satisfaction, a sense of control, and a low-stress level (Pedersen et al., 2016; Bradley et al., 2014).

Recent qualitative studies (Bui et al., 2021) approached the experience of performing diagnostic procedures, showing that some patients felt fear in the preceding weeks. In some cases, these procedures are perceived by patients as unpleasant and causing claustrophobia (Bui et al., 2021; Evans et al., 2017; Mathers et al., 2011; Strand et al., 2014 Dec 1).

The provision of patient information can contribute to the patient's needs, increase their collaboration, and reduce anxiety (Grilo et al., 2017).

The nature of the information provided before the procedures can influence the patient's expectations positively or negatively. Those who receive sufficient information about the entire process may have higher satisfaction (Kong et al., 2010).

Traditionally, information is provided verbally, mentioning the risks and benefits of the procedures for the patient, and clarifying any doubts. However, due to the complexity of some procedures in the health area, this method results in some patients not fully understanding them (Bowers et al., 2017). The literature has shown that most informational materials available to patients are written in a language that hinders understanding. Clear and accessible language is preferred by patients, regardless of their level of education (Donato and Donato, 2019; Hawker et al., 2002; Liberati et al., 2009; Schneider et al., 2020).

Several studies investigated pamphlets to improve and standardize the information given to patients. These studies showed mixed results, as many patients do not read the information or fully understand it (Donato and Donato, 2019; Stanley et al., 1998; Olver et al., 1995; Luck et al., 1999). Using health technological tools, such as audio and educational videos, can help to fill the gaps left by other ineffective forms of communication, such as leaflets or verbal information. These tools support the patient-centered care model by delivering understandable information (Topaz et al., 2020), enhancing information sharing between patients and families, and providing strategies that reduce patient anxiety during the procedure (Lisy et al., 2021; Sun et al., 2020; Pedro et al., 2020).

Literature has highlighted the effectiveness of using educational videos with patients (Brown et al., 1997; Jlala et al., 2010) and in medical education (Pinsky and Wipf, 2000). Jlala et al. (Jlala et al., 2010) observed that educating patients for elective surgery under regional anaesthesia using a short information film with a patient undergoing surgery, reduces patients' anxiety and has advantages in time efficiency, ease of use, and accessibility. Azer et al. (Azer et al., 2018) emphasize that professional societies and parents developed the most valuable educational videos concerning children with autism.

The development of an educational video begins with the definition of the video objectives and usually follows several steps: analysis and planning, modelling, implementation, evaluation, and distribution (Ab Hamid et al., 2021; Razera et al., 2019). Bloom's taxonomy (Dettmer, 2005) is commonly used to enhance patients' understanding and memorization of the video content. Finally, nowadays, several tools enable educational video content validation (Ab Hamid et al., 2021; de Leite et al., 2018).

Recently educational videos have been employed in preparing diagnostic medical procedures; however, there is no integrated understanding of their effects. Therefore, this systematic review evaluates the effectiveness of educational videos in patients undergoing diagnostic procedures, targeting their anxiety and satisfaction. Secondarily, it is intended to evaluate if educational videos impact patients' comfort, understanding, tolerance, worry, and adherence.

2. Methods

2.1. Study design

A systematic review and *meta*-analysis were carried out to assess the effectiveness of educational videos in patients who undergo diagnostic procedures regarding their anxiety and satisfaction. As a secondary aim, the following variables were also considered in the systematic review: comfort, understanding, tolerance, worry, and adherence.

This review considered the norms of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), contemplating 4 phases: Identification, Screening, Eligibility, and Inclusion (Liberati et al., 2009).

2.2. Study selection

The search for the studies to be included was conducted in three scientific databases in March 2021: PubMed, Web of Science, and Scopus. PubMed search was updated in May 2022. The articles were entered into data management software for systematic reviews. After removing duplicates, two authors (AF, MR) independently examined titles and abstracts; all disagreements were resolved by two other authors (AG, LV). During full text read, two authors (AF, MR) independently appoint out the exclusion reason; once again, any divergence was handled by two other authors (AG, LV) to reach a consensus.

2.3. Selection criteria

Original research papers were assessed for inclusion based on PICO (Participants, Intervention, Comparators, and Outcomes (Liberati et al., 2009) criteria detailed in Table 1.

Studies were considered eligible for inclusion if they contained the following criteria: (1) Studies between 2000 and 2021; (2) PubMed articles within the subsequent query: (patient education as topic[mesh Terms] OR patient education[Title/Abstract]) AND (educational video [Title/Abstract]) OR informative video[Title/Abstract]) AND (diagnostic techniques and procedures[mesh Terms]) OR diagnostic procedures[Title/Abstract]) OR diagnostic imaging[Title/Abstract]); (3) Web of Science and Scopus articles with the following keywords: "educational video", "anxiety", "patient satisfaction", "diagnostic procedures", "patient education", (4) Studies in Portuguese, English, and Spanish; (5) Studies with an adult population; (6) Studies that included educational videos as a form of preparation method for diagnostic procedures. Systematic reviews, studies with pediatric populations, and studies that did not present the entire text were excluded.

2.4. Data extraction and analysis

The data extraction of the studies to be included in the systematic review and *meta*-analysis was done by two authors independently after uploading articles into a systematic review data management software

Table 1
PICO criteria for inclusion in the systematic review.

Parameters	Inclusion criteria
P – Population	Adults (>18 years)
I - Intervention	Studies that evaluated the effectiveness of educational videos as a form of preparation for patients undergoing diagnostic procedures
C – Comparison	Control group patients with standard information for diagnostic medical procedures
O – Outcomes	Patients' anxiety, satisfaction, comfort, understanding tolerance and adherence

(Rayyan™), ensuring that all data was obtained. After a complete reading of the studies and using Excel®, the investigators collected the following data: year and country, type of study, aim, sample, intervention design, measurement instruments, and results.

2.5. Quality assessment

Two authors independently evaluated the selected studies using the Hawker et al. critical appraisal tool (Hawker et al., 2002), which assesses the studies in nine components (e.g., abstract and title, methods, and data) considering a four points scale from 1 (Very Poor) to 4 (Good). Therefore, a final score ranging from 9 (very poor) to 36 (good) was generated for each study. The ratings were subsequently cross-checked, and other authors solved discrepancies.

2.6. Meta-Analysis

The *meta*-analysis included only the anxiety parameter since the scales used to evaluate satisfaction presented significant heterogeneity and were not comparable. The other parameters, namely, comfort, understanding, tolerance, and adherence to the procedure, were evaluated in a minimal number of studies (one or two), not allowing their inclusion in the *meta*-analysis.

To perform the *meta*-analysis concerning anxiety, seven of the sixteen studies selected for the systematic review were included, which measured anxiety using the State-Trait Anxiety Inventory (STAI) scale, one of the best-established psychological measures of anxiety. It consists of 40 questions presented on a 4-point Likert scale: the first 20 relate to the assessment of state anxiety and the remaining 20 to trait anxiety. The State Anxiety Inventory (STAI-S) was used to perform the *meta*-analysis, which assesses how a person feels in a particular situation. Higher scores indicate higher levels of anxiety (Bradley et al., 2014; Lee et al., 2017; Vogel et al., 2012; Santos et al., 2018).

The remaining studies were not included in the *meta*-analysis due to: (1) not measuring anxiety (Bowers et al., 2017), (2) measuring anxiety on a different scale (Lattuca et al., 2018; Jamshidi et al., 2013; Torabizadeh et al., 2021; Xia et al., 2019), (3) STAI values were not available for the experimental and control groups (Pearson et al., 2005) (4) only measured anxiety, and satisfaction before the procedure (Sun et al., 2020; Wouters et al., 2019), and (5) the control group also viewed the educational video (Hu et al., 2020).

Meta-analysis was performed to compare anxiety levels between the control (without video) and experimental (with video) groups before and after the procedure. The necessary information to compare before and after the procedure in both groups was not available. Only two authors (Ayasrah and Ahmad, 2016; Ahlander et al., 2018) sent the information requested by the authors of the present article. For the *meta*-analysis models, it was considered that the variances were not equal, so the fixed effects model was used. To assess heterogeneity, that is, the variability or difference between studies in relation to the estimation of effects, the I^2 statistic and the Chi-Square (χ^2) test and respective p-value were used. The global effect test was performed using the Z statistic and its p-value. To assess the variability between studies, Tau^2 was used.

3. Results

3.1. Included studies

The initial search resulted in a total of 164 studies by searching PubMed (56), Web of Science (24), and Scopus (84) databases. Two additional studies were included using references lists of articles from the electronic databases.

Initially, the studies were independently analyzed by title and abstract by two authors, resulting in twenty-one articles analyzed thoroughly. Following this analysis, sixteen studies were selected for systematic review. Of these, nine studies are related to using an educational video in invasive vascular procedures; two studies were performed in the context of PET, two reported to colposcopy, one in MRI, one related to colonoscopy and one reported endoscopic retrogade cholangiopancreatography (ERCP). Seven of the sixteen studies selected for the systematic review were also included in the *meta*-analysis. Fig. 1 shows the PRISMA sequential diagram of the methodology applied.

3.2. Study characteristics

The articles analyzed used experimental methods, and thirteen of them presented themselves as randomized clinical trials. (Bowers et al., 2017; Sun et al., 2020; Lattuca et al., 2018; Jamshidi et al., 2013; Torabizadeh et al., 2021; Xia et al., 2019; Pearson et al., 2005; Ayasrah and Ahmad, 2016; Ahlander et al., 2018; Ketelaars et al., 2017; Ruffinengo et al., 2009; Tugwell et al., 2018; Rigatelli et al., 2009; Habibzadeh et al., 2018).

All sixteen studies included control and experimental groups to evaluate the effectiveness of the educational video. Specifically, in the Hu et al. study (Hu et al., 2020), the intervention group watched the educational video as often as they wanted, unlike the control group, who observed it only once. In all the other studies (Bowers et al., 2017; Sun et al., 2020; Lattuca et al., 2018; Jamshidi et al., 2013; Torabizadeh et al., 2021; Xia et al., 2019; Pearson et al., 2005; Wouters et al., 2019; Ayasrah and Ahmad, 2016; Ahlander et al., 2018; Ketelaars et al., 2017; Ruffinengo et al., 2009; Tugwell et al., 2018; Rigatelli et al., 2009; Habibzadeh et al., 2018), the intervention groups watched the educational video, contrary to the control group who did not see the educational video.

Of all the studies included in the systematic review, fourteen of these evaluated the use of an educational video on patient anxiety (Sun et al., 2020; Lattuca et al., 2018; Torabizadeh et al., 2021; Xia et al., 2019; Pearson et al., 2005; Wouters et al., 2019; Hu et al., 2020; Ayasrah and Ahmad, 2016; Ahlander et al., 2018; Ketelaars et al., 2017; Ruffinengo et al., 2009; Tugwell et al., 2018; Rigatelli et al., 2009; Habibzadeh et al., 2018) thirteen assessed its effect on patient satisfaction (Bowers et al., 2017; Sun et al., 2020; Lattuca et al., 2018; Jamshidi et al., 2013; Xia et al., 2019; Pearson et al., 2005; Wouters et al., 2019; Hu et al., 2020; Ahlander et al., 2018; Ketelaars et al., 2017; Ruffinengo et al., 2009; Tugwell et al., 2018; Rigatelli et al., 2009) and eleven studies evaluated both variables (Sun et al., 2020; Lattuca et al., 2018; Xia et al., 2019; Pearson et al., 2005; Wouters et al., 2019; Hu et al., 2020; Ahlander et al., 2018; Ketelaars et al., 2017; Ruffinengo et al., 2009; Tugwell et al., 2018; Rigatelli et al., 2009). Patients' anxiety was also assessed in three studies (Jamshidi et al., 2013; Ayasrah and Ahmad, 2016; Rigatelli et al., 2009) through hemodynamic parameters: blood pressure and heart rate.

The effect of watching the video on patient tolerance to the diagnostic procedure was evaluated in two studies (Jamshidi et al., 2013; Rigatelli et al., 2009), and the patient understanding (also considered as patient's knowledge) of information related to the procedure in four (Bowers et al., 2017; Lattuca et al., 2018; Xia et al., 2019; Pearson et al., 2005). Adherence to the procedure, worry and comfort were assessed in a single study (Pearson et al., 2005; Hu et al., 2020; Jamshidi et al., 2013), respectively.

Most of the studies included used previously validated measurement instruments, i.e., Hospital Anxiety and Depression Scale (HADS), STAI, Numeric Rating Scale (NRS), Patient's Experience and Attitude Colposcopy Eindhoven questionnaire (PEACE-q) and Cardiac Anxiety Questionnaire (CAQ); except for eight studies (Bowers et al., 2017; Sun et al., 2020; Lattuca et al., 2018; Xia et al., 2019; Pearson et al., 2005; Hu et al., 2020; Tugwell et al., 2018; Rigatelli et al., 2009), which made modifications and/or used questionnaires developed by the authors.

The qualitative assessment of the studies resulted in a range of quality scores from 26 points (Bowers et al., 2017) to 36 points (Hu et al., 2020; Tugwell et al., 2018). The characteristics of these studies and their quality scores are summarised in Table 2.

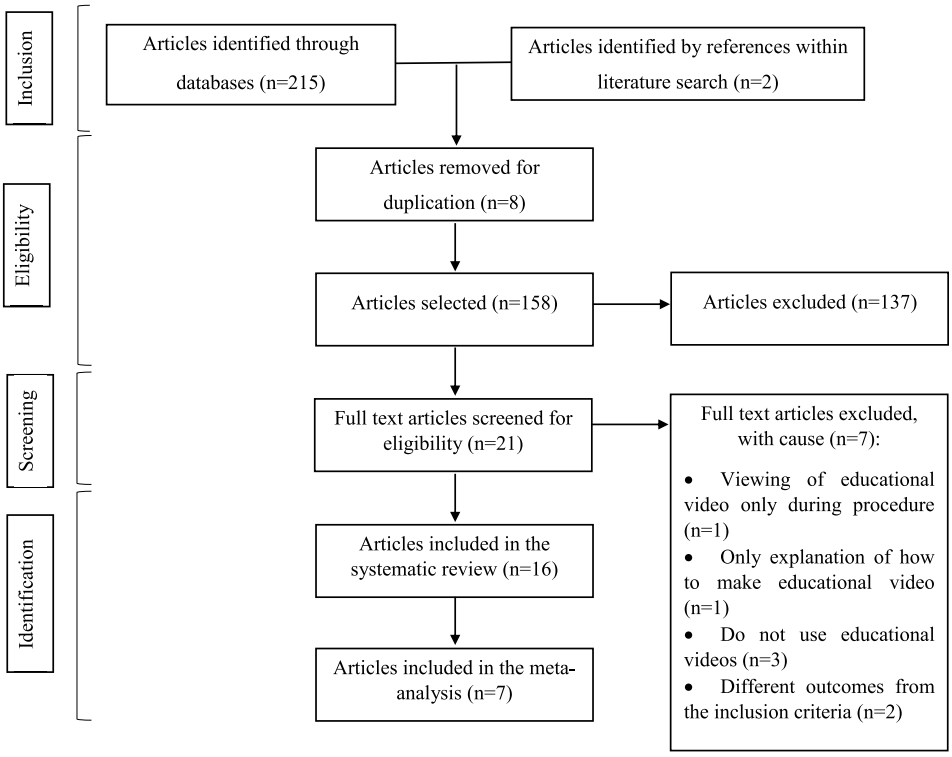


Fig. 1. PRISMA sequential diagram.

3.3. Effectiveness of educational video

The effectiveness of the videos was analyzed by comparing the intervention group (with patients who watch the educational video regarding diagnostic procedure) with the control group in seven variables: anxiety, patient satisfaction, comfort, understanding, tolerance, worry, and adherence.

According to Table 2, in nine of the studies that evaluated the effectiveness of educational video on anxiety (Sun et al., 2020; Torabizadeh et al., 2021; Hu et al., 2020; Ayasrah and Ahmad, 2016; Ahlander et al., 2018; Ruffinengo et al., 2009; Tugwell et al., 2018; Rigatelli et al., 2009; Habibzadeh et al., 2018), the intervention groups demonstrated statistically significant decreases in anxiety levels compared with a control group. The other four studies (Lattuca et al., 2018; Pearson et al., 2005; Wouters et al., 2019; Ketelaars et al., 2017) also reported lower anxiety levels for the intervention group than the control group, but this difference was not statistically significant. In Pearson et al. (Pearson et al., 2005) study, there was a significant effect on patients' worry on the day of the procedure. Only in Xia et al. (Xia et al., 2019) study the anxiety level was higher in the experimental group, although not statistically significant.

The anxiety-related hemodynamic parameters, namely, heart rate and blood pressure, evaluated in three studies (Jamshidi et al., 2013; Ayasrah and Ahmad, 2016; Rigatelli et al., 2009), decreased significantly in the experimental groups in two (Jamshidi et al., 2013; Rigatelli et al., 2009) and showed no differences in a third study (Ayasrah and Ahmad, 2016) compared to the control group.

Regarding satisfaction outcomes, in seven studies that evaluated the effectiveness of educational video on satisfaction with the diagnostic procedure (Bowers et al., 2017; Lattuca et al., 2018; Jamshidi et al., 2013; Xia et al., 2019; Hu et al., 2020; Ruffinengo et al., 2009; Rigatelli et al., 2009), scores were statistically significantly higher in the intervention group than the control group. The other studies (Bowers et al., 2017; Pearson et al., 2005; Wouters et al., 2019; Ahlander et al., 2018; Ketelaars et al., 2017; Tugwell et al., 2018) also reported higher satisfaction scores for the intervention group than the control group, but this difference was not statistically significant.

The only study (Jamshidi et al., 2013) that formally evaluated educational video effectiveness on comfort during the diagnostic procedure showed significantly higher comfort scores in the experimental group than in the control group. Concerning worry, in Pearson et al. (Pearson et al., 2005) study, there was a significant effect on patients' worry on the day of the procedure.

The studies that evaluate the effectiveness of educational video on understanding (Bowers et al., 2017; Lattuca et al., 2018; Xia et al., 2019; Pearson et al., 2005), tolerance (Jamshidi et al., 2013; Rigatelli et al., 2009) and adherence to the diagnostic procedure (Hu et al., 2020) showed that intervention groups had statistically significantly higher scores in these parameters compared to the control group.

3.4. Meta-Analysis

3.4.1. Before the procedure

From the analysis of the results in Fig. 2, there is significant heterogeneity between the studies ($I^2 = 94.062$; $\chi^2_5 = 84.198$, $p = 0.000$; $z = 4.266$, $p = 0.000$; $Tau^2 = 0.635$), mainly due to the Ayasrah et al. (Ayasrah and Ahmad, 2016) study. The difference in mean anxiety levels between the control and experimental groups is positive and significant, meaning that the control group had significantly higher mean anxiety levels. There were no statistically significant differences in mean anxiety levels between the two groups for the remaining studies, which means that the groups are identical in terms of anxiety levels before the procedure. From the Forest Plot analysis (Fig. 2), there is some overlap in the results of the studies.

3.4.2. After the procedure

From the analysis of the results in Fig. 3, there is significant heterogeneity among the studies ($I^2 = 95.894$; $\chi^2_6 = 146.116$, $p = 0.000$; $z = 10.582$, $p = 0.000$; $Tau^2 = 1.061$). After the procedure, the differences in mean anxiety levels between the control and experimental group were positive and significant in four studies: Ayasrah et al., Ruffinengo et al., Rigatelli et al., and Habibzadeh et al. (Ayasrah and Ahmad, 2016;

Table 2
Characteristics and quality scores of the eligible studies for the systematic review (n = 16).

Author, Year, Country	Aim	Study type	Sample	Intervention design	Measurement instruments	Results	Quality score
Bowers et al. (Bowers et al., 2017);2015; Canada	Evaluate the usefulness of multimedia presentation on patient understanding and satisfaction in intravascular procedures.	Randomized Controlled Trial	**Total** = 93 **CG** = 44 **EG** = 49	**CG**[1] – Standard information with didactic method **EG**[2] - Standard information with didactic method + multimedia presentation	Questionnaires to assess understanding and satisfaction - pre-procedure	EG with significant higher understanding and satisfaction scores.	26
Sun et al. (Sun et al., 2020), 2020, China	Evaluate the effect of viewing a video on reducing patient anxiety and increasing image quality in positron emission tomography/ CT scan	Randomized Controlled Trial	**Total** = 198; **Asymptomatic:** CG = 50 EG = 48 **Cancer patients:** CG = 50 EG = 50	**CG** - Standard oral and written information on the consultation day; **EG** - Standard oral and written information on the consultation day + EV viewed on the waiting room the same day	STAI-S[3], STAI-T[4], and satisfaction questionnaires- post-procedure	Statistically, significant anxiety decreases in cancer patients of the EG group.	35
Lattuca et al. (Lattuca et al., 2018), 2018, France	Assess the incremental value of video on coronary angiography compared to standard information on patient understanding, satisfaction and anxiety.	Randomized Controlled Trial	**Total** = 821 **CG** = 415 **EG**[11] = 406	**CG** – Standard oral and written information **EG** – Standard information + video	VAS[5]-10 points satisfaction VAS −10 points anxiety and questions comprehension questionnaire - pre-procedure	Satisfaction and understanding of information were significantly higher in EG. Anxiety levels did not significantly differ between EG and CG.	35
Jamshidi et al. (Jamshidi et al., 2013); 2012, Iran	Evaluate the effect of EV[6] use on satisfaction, comfort, tolerance, and hemodynamic parameters compared to verbal information in coronary angiography	Randomized controlled trial	**Total** = 128 **CG** = 64 **EG** = 64	**CG** – Standard information the day before (services visit); **EG** - Standard information the day before (services visit) + EV	Hemodynamic parameters - at the day before procedure and immediately pos-information; VAS-10 points comfort − 6 h afterwards transfer; Likert scale-(0–4) tolerance - immediately afterwards transfer; Likert scale-(1–4) satisfaction − 6 h afterwards transfer	No significant baseline differences between the CG and EG in hemodynamic parameters.EG with significantly lower heart rate and blood pressure post-intervention. Significant higher levels of comfort, satisfaction, and tolerance in EG.	35
Torabizadeh et al. (Torabizadeh et al., 2021); 2021; Iran	Compare the effect of DVD[7] or SMS[8] in the provision of information for angiography with leaflets on the psychological parameters of patients.	Randomized controlled trial	**Total** = 120 **CG** = 40 **EG1 (DVD)** = 40 **EG1 (SMS)** = 40	**CG** – verbal information + leaflet pre-procedure; **EG1 (DVD)** - EV 15 min pre procedure; **EG2 (SMS)** − 7 SMS/day on the 4 days pre procedure	DASS-21[9] (domains of stress, anxiety, and depression) pre-procedure + 30 min post-procedure	No significant baseline differences between CG, EG1 and EG2. The mean post-intervention scores in all DASS-21 domains were significantly lower among EG1 and EG2 compared to CG.	35
Xia et al. (Xia et al., 2019), 2019, China	Compare efficacy of EV to written informed consent in patients understanding, satisfaction and anxiety on ERCP[10]	Randomized controlled trial	Total=205; CG=104; EG=101	CG – standard written information EG - standard written information + EV	Likert-Scale (1–3) for Anxiety and Satisfaction; Multiple-choice questionnaire to evaluate patient's understanding on ERCP – one to two days pre procedure	No significant effect in anxiety levels between EG e EC (although with higher anxiety in the EG). Significantly increase in EG satisfaction and understanding of ERCP procedure (potential risks and complications).	32
Pearson et al. 45], 2005, Australia	Evaluate the efficacy of an EV on anxiety, worry, knowledge and satisfaction on colonoscopy	Randomized controlled trial	**Total**=79 **CG**=38 **EG**=41	**CG** – Standard written information **EG** - Standard written information + EV	STAI and Likert-Scale (0–10) for worry – one-week pre procedure and immediately pre procedure. Knowledge Questionnaire and patient Satisfaction Scale (from 1 to 5) – immediately pre procedure	Increase in short-term knowledge. Significant main effect of video on increasing knowledge about complications and total knowledge scores No significant effect on anxiety or patient satisfaction, but significant effect on worry on the day of the procedure.	32

(*continued on next page*)

Table 2 (*continued*)

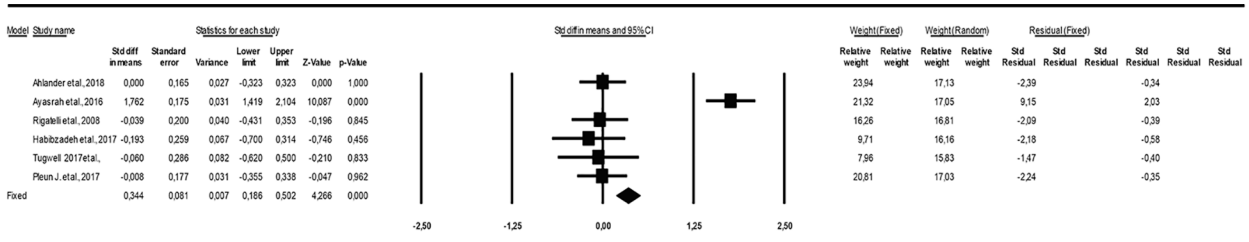
						Higher satisfaction with the information delivered significantly associated with less anxiety.	
Wouters et al. (Wouters et al., 2019), 2019, The Netherlands	Evaluate the use of EV in reducing consultation time, pre-colposcopy anxiety levels, and increasing post-colposcopy satisfaction.	Experimental	Total=122 CG=61 EG=61	CG – verbal information; EG – verbal information + EV	STAI; HADS[11]; PEACE-q[12] - immediately pre- and post-procedure	No significant baseline differences between CG and EG. Anxiety and satisfaction were not significantly different in post-intervention. Significant reduction in pre-colposcopy consultation time.	33
Hu et al. (Hu et al., 2020); 2020; China	Assess the effect of an EV by quick response code on anxiety, adherence, and satisfaction in coronary angiography.	A prospective controlled trial	**Total**=335 **CG**=169 **EG**=166	**CG** - Standard written and oral information the day before + EV once; **EG** - Standard written and verbal information the day before + EV as many times as they want;	Chinese STAI - one day before, 2h pre-procedure + 4h post-procedure; VAS-10 points for satisfaction − 4h post-procedure; 7-item checklist for adherence − 2h pre-procedure + 1h post-procedure	No significant baseline differences in anxiety levels between CG and EG. Significant lower anxiety pre and post procedure in both groups compared to baseline.Significant higher anxiety in the CG 2h before the procedure.EG showed significant higher adherence and satisfaction.	36
Ayasrah et al. (Ayasrah and Ahmad, 2016); 2016; Jordan	Evaluate the efficacy of EV in reducing pre- cardiac catheterization anxiety.	Randomized controlled trial	**Total**=182 **CG**=91 **EG**=91	**CG** - Standard oral information; **EG** – Educational intervention pre-procedure	Hemodynamic parameters − 15–30 min after admission + 2h pre-procedure + 6-24h post-procedure; STAI-S − 15–30 min after admission + 2h pre-procedure + 6-24h post-procedure	No significant baseline differences in anxiety levels and hemodynamic parameters between CG and EG.Significant lower pre- and post-procedure anxiety in EG.No significant differences in hemodynamic parameters in two times.	31
Ahlander et al. (Ahlander et al., 2018), 2018, Sweden	Evaluate the effect of an informational video on anxiety and motion artefacts in Cardiac MRI[13] and MPS[14].	A prospective randomized controlled trial	**Total**=97 **CG**=48 **EG**=49	**CG** – Standard written information; **EG** - Standard written information + EV pre-procedure	CAQ[15];STAI-S; HADS; MRI-FSS[16] pre-procedure and post-procedure; MRI-AQ[17] (anxiety and relaxation sub-scales) – post-procedure and the week post-procedure	No significant baseline differences between CG and EG.Post-intervention significantly lower relaxation sub-scale scores in EG.Post -intervention lower anxiety levels in EG, but not statistically significantly.	33
Ketelaars et al. (Ketelaars et al., 2017); 2017; The Netherlands	Evaluate the EV effect on reducing anxiety, depression, and pain levels in colposcopy.	Randomized controlled trial	Total=128 CG=65 EG=63	CG – Standard written information; EG - Standard written information + EV	HADS; STAI; RAND-12 HSI[18]; NRS[19] - five days pre-procedure and immediately post-procedure	No significant baseline differences between CG and EG. Post -intervention less anxiety, especially in extremely anxious patients, without significant differences, and higher EG satisfaction.	31
Ruffinengo et al. (Ruffinengo et al., 2009); 2009; Italy	Evaluate the EV effectiveness on reducing anxiety and increasing patient satisfaction with the information received on coronarography.	Randomized controlled trial	Total=93; CG=45; EG=48	CG – standard information EG - EV + standard information	STAI; VAS – five to ten minutes pre procedure	Significant reduction in pre procedure anxiety and increase in satisfaction regarding the informationrmation received.	33
Tugwell et al. (Tugwell et al., 2018), 2017, UK	Evaluate the use of EV in reducing MRI[3] anxiety, comparing to telephone conversations with a radiology technician.	Randomized controlled trial	Total=74.CG =24.EG1(V) =25.EG2 (PC) =25	CG - written information. EG1 (V) – 4min EV.EG2 (C[14])– Phone Call with a Radiology technician.	STAI measured at home and pre- and post-procedure Image Quality post-procedure	No significant baseline differences between CG, EG1 and EG2.Post -intervention significant lower anxiety and higher satisfaction in the EG1 and EG2. There was no relationship between anxiety and motion artefacts.	36

(*continued on next page*)

Table 2 (*continued*)

Rigatelli et al. (Rigatelli et al., 2009); 2008; Italy	Evaluate the Impact of multimedia protocols on pre-procedure education of patients with congenital heart malformations.	Experimental	**Total**=100 **CG**=50 **EG**=50	**CG** - Standard oral information + 30 min interview 15 days pre-procedure **EG** – Multimedia program + 30 min interview 15 days pre-procedure	STAI; Tolerance and Satisfaction (0–3); Heart Rate – 15 days pre-procedure and immediately post-procedure	No significant baseline differences between CG and EG. regarding anxiety.Post -intervention significant lower anxiety and heart rate, fewer vaso-vagal episodes, and higher satisfaction and tolerance in EG.	27
Habibzadeh et al. (Habibzadeh et al., 2018); 2018; Iran	Evaluate the effects of video-based and combined peer and video-based peer education on anxiety in coronary angiography.	Randomized Controlled Trial	**Total**=120 **CG**=30 **EG1(PE[12])** =30; **EG2 (V)**=30 **EG3 (PE + V)** = 30	**CG** – Standard information. **EG1 (PE)** – Peer Education **EG2 (V)** - EV **EG3 (PE + V)** – Peer Education + EV	STAI-S – 24h pre-procedure + 30 min pre-procedure	No significant baseline differences in anxiety scores in the four groups. Significant lower post-intervention anxiety in the three EGs.No differences in anxiety between the three EGs.	32

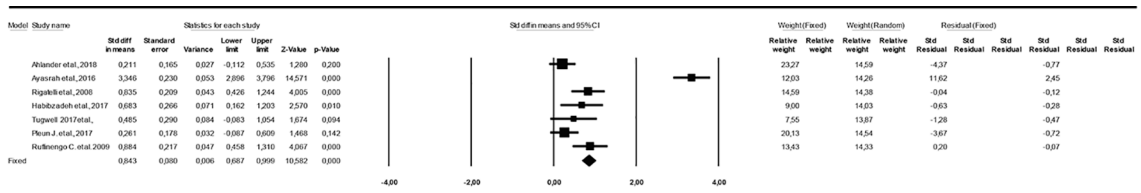
[1](EV) – Educational Video
[2](info) – Information
[3](MRI) – Magnetic Resonance
[4](MPS) – Myocardial Perfusion Scintigraphy
[5](QR) – Quick Response
[6](CATH) – Cardiac Catheterization
[7](DVD) – Digital Versatile Disc
[8](SMS) – Short Message Service
[9](T) – Total
[10](CG) – Control Group
[11](EG) –Experimental Group
[12](PE) – Peer Education
[13](V) – Video
[14](C) –Telephone Call
[15](VAS) – Visual Analogue Scale
[16](STAI-S) – State Trait Anxiety Inventory-State
[17](STAI-T) – State Trait Anxiety Inventory-Trait
[18](CAQ) - Cardiac Anxiety Questionnaire
[19](HADS) – Hospital Anxiety and Depression Scale
[20](MRI-FSS) - Magnetic Resonance Imaging - Fear Survey Schedule
[21](MRI-AQ) - Magnetic Resonance Imaging- Anxiety Questionnaire
[22](DASS-21) - Depression Anxiety Stress Scale-21
[23](PEACE-q) - Patient's Experience and Attitude Colposcopy Eindhoven questionnaire
[24](RAND-12 HSI) - RAND-12 Health Status Inventory
[25](NRS) - Numeric Rating Scale
[26](ERCP) – Endoscopic retrogade cholangiopancreatography



Model	Number Studies	Point estimate	Standard error	Variance	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	6	0,344	0,081	0,007	0,186	0,502	4,266	0,000	84,198	5	0,000	94,062	0,635	0,449	0,201	0,797
Random	6	0,252	0,337	0,113	-0,408	0,912	0,747	0,455								

Fig. 2. Forest Plot compares anxiety levels before the exam, between the experimental and control groups, and model statistics.

Ruffinengo et al., 2009; Rigatelli et al., 2009; Habibzadeh et al., 2018). Although the differences are not statistically significant in the remaining three studies, they are positive, revealing that the experimental group has lower anxiety levels after the procedure. From the Forest plot analysis (Fig. 3), there is no overlap of the results of the studies. However, they show the same trend, i.e., the experimental group shows lower anxiety levels than the control group. Globally this trend is statistically significant.



Model	Effect size and 95% confidence interval					Test of null (2-Tail)		Heterogeneity				Tau-squared			
Model	Number Studies	Point estimate	Standard error	Variance	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau Squared	Standard Error	Variance	Tau
Fixed	7	0,843	0,080	0,006	0,687	0,999	10,582	0,000	146,116	6	0,000	95,894	1,061	0,672	0,451	1,030
Random	7	0,956	0,399	0,159	0,175	1,737	2,398	0,016								

Fig 3. Forest Plot compares anxiety levels after the exam, between the experimental and control groups, and model statistics.

4. Discussion

This systematic review evaluates the effectiveness of educational videos in patients undergoing diagnostic procedures, targeting their anxiety and satisfaction. The effects on patient anxiety were also assessed by *meta*-analysis since the heterogeneity in satisfaction measures does not allow to perform it with this variable. In addition, it was possible to evaluate the impact of educational videos on patients' comfort, understanding, tolerance, and adherence in a smaller number of studies.

4.1. Anxiety

Concerning the anxiety of patients undergoing diagnostic procedures, it was evidenced that the use of educational videos to provide information results in its decrease, as verified in nine studies (Bowers et al., 2017; Torabizadeh et al., 2021; Hu et al., 2020; Ayasrah and Ahmad, 2016; Ahlander et al., 2018; Ruffinengo et al., 2009; Tugwell et al., 2018; Rigatelli et al., 2009; Habibzadeh et al., 2018).

Of the sixteen studies included in this systematic review, two of these also compared the provision of information through educational videos with telecommunications for the same purpose and compared it with standardized information, either verbal or written. Tugwell et al. (Tugwell et al., 2018) and Torabizadeh et al. (Torabizadeh et al., 2021) have shown that both methods effectively reduce anxiety. Torabizadeh et al. (Torabizadeh et al., 2021) also found that an educational video was more effective when compared to a phone call with a health professional, although not to a statistically significant degree.

Five studies (Lattuca et al., 2018; Xia et al., 2019; Pearson et al., 2005; Wouters et al., 2019; Ketelaars et al., 2017) showed no significant differences in anxiety after viewing an educational video. However, the Lattuca et al. (Lattuca et al., 2018) study found a tendency towards anxiety decrease. Additionally, the authors noticed that patients had a more robust understanding of the procedure and its potential risks. Similarly, Pearson et al. (Pearson et al., 2005) report that patients who watch a video on the colonoscopy procedure remembered more information regarding complications and had greater overall understanding than those who did not, and a higher level of satisfaction with the information received through the video was significantly associated with lower anxiety during pre-admission and on the day of the colonoscopy. Although there was no significant effect on anxiety in the patients who watched the video, these patients-reported less worry on the day of the procedure. On the other hand, in a study concerning colposcopy, Wouters et al. (Wouters et al., 2019) hypothesized that the lack of significant decreases of anxiety levels related to the animated video might be due to the internet offering easy access to all kinds of medical information. As a result, some patients tend to search for information about the procedure they will be submitted to, making them more informed. Furthermore, the pre-colposcopy consultation time in the women who looked at the animated video was lower than in the control group. Ketelaars et al. (Ketelaars et al., 2017) is also a study related to colposcopy. Although the educational video did not significantly reduce anxiety, there was a decrease in anxiety levels among the more anxious patients, and most patients responded positively to the video. Finally, Xia et al. (Xia et al., 2019) study aimed to deliver patients adequate comprehension of an ERCP procedure's risks and adverse events. The video show adverse effects like hemorrhageand perforation. These images increase the patient's understanding of the ERCP possible risks and problems, but some patients' anxiety levels are raised, particularly young females. The authors believed that these patients were unprepared to observe an ERCP procedure. These results highlight the need to ask patients if they want to see any procedure-related images, especially considering more aversive procedures.

Heart rate and blood pressure, evaluated in three studies, decreased in the experimental groups in two (Jamshidi et al., 2013; Rigatelli et al., 2009) and showed no differences in a third study compared to the control group. In the first study by Jamshidi et al. (Jamshidi et al., 2013), hemodynamic parameters were measured before providing information and immediately after. In contrast, Rigatelli et al. (Rigatelli et al., 2009) measured fifteen days before the diagnostic procedure and immediately after the second study.

The use of a low-cost device, as an educational video, is of great importance since anxiety in patients undergoing diagnostic tests compromises diagnostic quality due to involuntary patient movements (Basso et al., 2009) and interferes with service workflow related to healthcare pressure to calm down the patient (Vogel et al., 2012) and eventual demanding of image repetition. (Vogel et al., 2012; Basso et al., 2009); Finally, anxiety during medical procedures enhances a patient's negative experience (Grilo et al., 2017; Vogel et al., 2012), increasing the likelihood of non-adherence or postponing subsequent screening tests. (Pehlivan et al., 2011).

4.2. Satisfaction

Thirteen of the sixteen studies included in this systematic review evaluated satisfaction. Twelve of them reported increased satisfaction after watching an educational video, although only seven were statistically significant. As Wouters et al. (Wouters et al., 2019) mentioned, the absence of significant differences between groups in satisfaction after viewing an educational video may be because patients currently tend to ask health professionals about the entire procedure until they are satisfied.

Patient satisfaction is one of the dimensions of healthcare quality and an essential metric for quality assessment (Pehlivan et al., 2011). High levels of patient satisfaction also empower patients to participate in managing their treatment, diagnostic and overall health (WHO, 2021).

4.3. Other variables

The level of comfort patients experienced, when evaluated, was

shown to be increased in the groups that received the video. The same occurs with tolerance to the procedure, adherence, and understanding. These results mean that the levels of comfort, tolerance, adherence, and understanding of the procedure may be related to the patients' ability obtained from the educational videos.

4.4. Strengths and limitations

The results of this systematic review are of clinical relevance since they demonstrate that viewing an educational video about diagnostic procedures effectively reduces anxiety and increases patient satisfaction, which was the main objective of the study. In addition, increased comfort, tolerance, understanding, and adherence to the procedure were also reported. In the development of this systematic review, some limitations were identified. The study search strategy, although structured, cannot be considered flawless and may have omitted some relevant studies. Another limitation is the small number of scientific studies related to this topic, considering that our systematic review is related to diagnostic medical procedures in general. There are several educational videos implemented in multiple hospitals. Nevertheless, few have been studied to evaluate their effectiveness on patients. Finally, using measurement instruments is not common to all studies, creating correlations biases.

Additional studies that evaluate the effectiveness of educational videos already implemented in-hospital services are suggested. Furthermore, given the heterogeneity in the measurement instruments and the small number of articles included in the systematic review, additional studies are recommended to effectively conclude the effectiveness of educational videos on the anxiety and satisfaction of patients undergoing diagnostic procedures and comfort, tolerance, understanding, and adherence to the procedure.

5. Conclusions and implications of the study

To our knowledge this review is the first to evaluate the effectiveness of educational videos in patients undergoing diagnostic procedures concerning their anxiety, satisfaction, comfort, understanding, adherence, and tolerance.

The results suggest that educational videos effectively reduce anxiety and increase the satisfaction of patients who have been submitted to diagnostic procedures. This methodology also seems to contribute to greater understanding, comfort, tolerance, and adherence to the procedures performed. Compared to other forms of information, such as verbal information or pamphlets, educational videos showed more significant advantages. To ensure their success, patients should have access to the videos before undergoing the procedure.

Although future studies will be required to have more evidence that may confirm the current results, this systematic review and *meta*-analysis will assist health professionals in preparing patients for diagnostic procedures by using practical tools. These results will also improve the patient's knowledge and experience of performing diagnostic procedures.

Funding

This study was funded by Instituto Politécnico de Lisboa, Portugal (ref. IPL/2020/VEDPET_ESTeSL) and Fundação para a CIência e a Tecnologia (ref. UIDB/05608/2020 and UIDP/05608/2020).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2022.101895.

References

Ab Hamid, M.R., Mohd Yusof, N.D.B., Buhari, S.S., Abd Malek, K., Noor, Md.H., 2021. Development and validation of educational video content, endorsing dietary adjustments among patients diagnosed with hypertension. Int. J. Heal. Promot. Educ. 1–12. https://doi.org/10.1080/14635240.2021.1958695.

Abreu, C., Grilo, A., Lucena, F., Carolino, E. 2017. Oncological Patient Anxiety in Imaging Studies: the PET/CT Example. J. Cancer Educ. [Internet]. 2017 Dec 1 [cited 2021 Jun 25];32(4):820–826. Available from: https://repositorio.ipl.pt/handle/10400.21/6308.

Ahlander, B.M., Engvall, J., Maret, E., Ericsson, E., 2018. Positive effect on patient experience of video information given prior to cardiovascular magnetic resonance imaging: a clinical trial. J. Clin. Nurs. [Internet]. 27 (5–6), 1250–1261.

Ayasrah, S.M., Ahmad, M.M., 2016. Educational video intervention effects on periprocedural anxiety levels among cardiac catheterization patients: a randomized clinical trial. Res. Theory Nurs. Pract. 30 (1), 70–84.

Azer, S.A., Bokhari, R.A., AlSaleh, G.S., Alabdulaaly, M.M., Ateeq, K.I., Guerrero, A.P.S., et al., 2018. Experience of parents of children with autism on YouTube: are there educationally useful videos? Informatics Heal. Soc. Care 43 (3), 219. https://doi.org/10.1080/17538157.2018.1431238.

Basso, D., Passmore, G., Holman, M., Rogers, W., Walters, L., Zecchin, T., et al., 2009. Semiqualitative visual and quantitative morphometric evaluations of reduced scan time and wide-beam reconstruction in rest-gated stress SPECT myocardial perfusion imaging. J Nucl. Med. Technol. 37 (4), 233–239.

Bradley, Y.C., Barlow, P., Osborne, D.R. 2014. Reduction of patient anxiety in PET/CT imaging by improving communication between patient and technologist. J Nucl Med Technol [Internet]. [cited 2021 Jul 12];42(3):211–217. Available from: https://pubmed.ncbi.nlm.nih.gov/25033886/.

Brown, S.J., Lieberman, D.A., Gemeny, B.A., Fan, Y.C., Wilson, D.M., Pasta, D.J., 1997. Educational video game for juvenile diabetes: results of a controlled trial. Med. Informatics. 22 (1), 77–89.

Bowers, N., Eisenberg, E., Montbriand, J., Jaskolka, J., Roche-Nagle, G. 2017. Using a multimedia presentation to improve patient understanding and satisfaction with informed consent for minimally invasive vascular procedures. Surgeon [Internet]. 5 (1):7–11. Available from: https://doi.org/10.1016/j.surge.2015.09.001.

Bui, K.T., Liang, R., Kiely, B.E., Brown, C., Dhillon, H.M., Blinman, P., 2021. Scanxiety: a scoping review about scan-associated anxiety. BMJ Open. 11 (5), e043215.

Coping with "Scanxiety" during and after Cancer Treatment | Memorial Sloan Kettering Cancer Center [Internet]. [cited 2021 Jun 25]. Available from: https://www.mskcc.org/news/coping-scanxiety-during-and-after-treatment.

de Leite, S., Áfio, A.C.E., Carvalho, l.V.de, Silva, J.M.da, Almeida, P.C.de, Pagliuca, L.M.F., 2018. Construction and validation of an educational content validation instrument in health. Rev. Bras. Enferm. 71 (suppl 4), 1635–1641.

Dettmer, P., 2005. New blooms in established fields: four domains of learning and doing. Roeper Rev. 28 (2), 70–78.

Domènech, A., Notta, P., Benítez, A., Ramal, D., Rodríguez-Bel, L., Massuet, C., et al. 2010. Valoración del estado de ansiedad de los pacientes que reciben un tratamiento con radioyodo o son sometidos a una exploración de ganglio centinela en el servicio de Medicina Nuclear. Rev. Española Med. Nucl. [Internet]. 2010 Mar [cited 2021 Jun 25];29(2):63–72. Available from: https://pubmed.ncbi.nlm.nih.gov/20167394/.

Donato, H., Donato, M., 2019. Stages for undertaking a systematic review. Acta Med. Port. 32 (3), 227–235.

Elboga, U., Elboga, G., Can, C., Sahin, E., Karaoglan, H., Kalender, E., et al., 2015. Assessment of procedure related anxiety and depression in oncologic patients before F-18 FDG PET-CT imaging. African J. Psychiatry (South Africa). 18 (1), 2013–2016.

Evans, R., Taylor, S., Janes, S., Halligan, S., Morton, A., Navani, N., et al., 2017. Patient experience and perceived acceptability of whole-body magnetic resonance imaging for staging colorectal and lung cancer compared with current staging scans: a qualitative study. Sep 1 [cited 2021 Jun 25]. Available from: BMJ Open [Internet]. 7 (9), e016391 http://bmjopen.bmj.com/.

Grilo, A., Vieira, L., Carolino, E., Oliveira, C., Pacheco, C., Castro, M., et al., 2017. Anxiety in cancer patients during 18 F-FDG PET/CT low dose: a comparison of anxiety levels before and after imaging studies. Nurs. Res. Pract. 2017, 1–9.

Habibzadeh, H., Milan, Z.D., Radfar, M., Alilu, L., Cund, A., 2018. Effects of peer-facilitated, video-based and combined peer-and-video education on anxiety among patients undergoing coronary angiography: randomised controlled trial. Sultan Qaboos Univ. Med. J. [Internet]. 18 (1), e61.

Hawker, S., Payne, S., Kerr, C., Hardey, M., Powell, J., 2002. Appraising the evidence: reviewing disparate data systematically. Qual. Health Res. 12 (9), 1284–1299.

Hu, J., Ren, J., Zheng, J., Li, Z., Xiao, X., 2020. A quasi-experimental study examining QR code-based video education program on anxiety, adherence, and satisfaction in coronary angiography patients. Contemp. Nurse [Internet] 56 (5–6), 428–440.

Jamshidi, N., Abbaszadeh, A., Kalyani, M.N., Sharif, F., 2013. Effectiveness of video information on coronary angiography patients' outcomes. Collegian [Internet] 20 (3), 153–159.

Jlala, H.A., French, J.L., Foxall, G.L., Hardman, J.G., Bedforth, N.M., 2010. Effect of preoperative multimedia information on perioperative anxiety in patients

undergoing procedures under regional anaesthesia. Br. J. Anaesth. [Internet] 104 (3), 369–374.
Karadeniz, G., Tarhan, S., Yanýkkerem, E., Dedeli, Ö., Kahraman, E. 2008. Anxiety and Depression in Patients Before Magnetic Resonance and Computer Tomography. 77–83.
Ketelaars, P.J.W., Buskes, M.H.M., Bosgraaf, R.P., van Hamont, D., Prins, J.B., Massuger, L.F.A.G., et al., 2017. The effect of video information on anxiety levels in women attending colposcopy: a randomized controlled trial. Acta Oncol. (Madr) [Internet] 56 (12), 1728–1733.
Kong, C.B., Jeon, D.W., Chang, B.S., Lee, J.H., Suk, K.S., Park, J.B. 1976. Outcome of spinal fusion for lumbar degenerative disease: A cross-sectional study in Korea. Spine (Phila Pa 1976) [Internet]. 2010 Jul 1 [cited 2021 Jun 25];35(15):1489–1494. Available from: https://pubmed.ncbi.nlm.nih.gov/20535050/.
Kutlutürkan, S., Görgülü, Ü., Fesci, H., Karavelioglu, A. 2010. The effects of providing pre-gastrointestinal endoscopy written educational material on patients' anxiety: A randomised controlled trial. Int. J. Nurs. Stud. [Internet]. 2010 Sep 1 [cited 2021 Jun 30];47(9):1066–1073. Available from: https://pubmed.ncbi.nlm.nih.gov/20181334/.
Lattuca, B., Barber-Chamoux, N., Alos, B., Sfaxi, A., Mulliez, A., Miton, N., et al., 2018. Impact of video on the understanding and satisfaction of patients receiving informed consent before elective inpatient coronary angiography: a randomized trial. Am. Heart J. [Internet] 200, 67–74.
Lee, W.L., Sung, H.C., Liu, S.H., Chang, S.M., 2017. Meditative music listening to reduce state anxiety in patients during the uptake phase before positron emission tomography (PET) scans. Br. J. Radiol. 90 (1070).
Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., Gøtzsche, P.C., Ioannidis, J.P.A., et al., 2009. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ 339.
Lisy, K., Kent, J., Piper, A., Jefford, M., 2021. Facilitators and barriers to shared primary and specialist cancer care: a systematic review. Support Care Cancer 29 (1), 85–96.
Luck, A., Pearson, S., Maddern, G., Hewett, P., 1999. Effects of video information on precolonoscopy anxiety and knowledge: a randomised trial. Lancet [Internet] 354 (9195), 2032–2035.
Mathers, S.A., McKenzie, G.A., Robertson, E.M. 2011. A necessary evil: The experiences of men with prostate cancer undergoing imaging procedures. Radiography [Internet]. [cited 2021 Jun 25];17(4):284–291. Available from: http://www.radiographyonline.com/article/S1078817411000654/fulltext.
Munn, Z., Jordan, Z. The patient experience of high technology medical imaging: a systematic review of the qualitative evidence. JBI Database Syst. Rev. Implement Rep. [Internet]. 2011 [cited 2021 Jun 25];9(19):631–678. Available from: https://pubmed.ncbi.nlm.nih.gov/27820215/.
Olver, I.N., Turrell, S.J., Olszewski, N.A., Willson, K.J., 1995. Impact of an information and consent form on patients having chemotherapy. Available from: Med. J. Aust. [Internet] 162 (2), 82–83.
Pedersen, G.A., Stenstad, L.I., Landmark, A.D., Brattheim, B. 2016. Information given to patients undergoing nuclear medicine procedures. CEUR Workshop Proc. 1574(Pahi 2015):81–90.
Pedro, B., Henriques, D., Grilo, A., Vieira, L.O., 2020. Estratégias não-farmacológicas para redução da ansiedade em doentes submetidos a PET/CT: revisão sistematizada de literatura. Saúde Tecnol. [Internet] (24), 21–29.
Pearson, S., Maddern, G.J., Hewett, P., 2005. Interacting effects of preoperative information and patient choice in adaptation to colonoscopy. Dis. Colon Rectum. 48 (11), 2047–2054.
Pifarré, P., Simó, M., Gispert, J.D., Pallarés, M.D., Plaza, P., Martínez-Miralles, E. 2011. Pruebas de diagnóstico por la imagen: ¿generan ansiedad? Rev. Española Med. Nucl. [Internet]. 2011 Nov [cited 2021 Jul 13];30(6):346–350. Available from: https://pubmed.ncbi.nlm.nih.gov/21764482/.
Pehlivan, S., Ovayolu, N., Koruk, M., Pehlivan, Y., Ovayolu, Ö., Gülşen, M.T., 2011. Effect of providing information to the patient about upper gastrointestinal endoscopy on the patient's perception, compliance and anxiety level associated with the procedure. Turkish J. Gastroenterol. 22 (1), 10–17.
Pinsky, L.E., Wipf, J.E., 2000. A picture is worth a thousand words: practical use of videotape in teaching. J. Gen. Intern. Med. 15 (11), 805–810.
Razera, A.P.R., Trettene, A.D.S., Mondini, C.C.D.S.D., Cintra, F.M.R.N., Razera, F.P.M., Tabaquim, M.D.L.M., 2019. Construction of an educational video on postoperative care for cheiloplasty and palatoplasty. Texto e Context Enferm. 28, 1–13.
Rigatelli, G., Magro, B., Ferro, S., Bedendo, E., Cominato, S., Mantovan, R., et al., 2009. Education, and obtaining of informed consent, using multimedia before adults with congenitally malformed hearts are submitted to transcatheter interventions. Cardiol. Young [Internet] 19 (1), 60–63.
Ruffinengo, C., Versino, E., Renga, G., 2009. Effectiveness of an informative video on reducing anxiety levels in patients undergoing elective coronarography: an RCT. Eur. J. Cardiovasc. Nurs. [Internet] 8 (1), 57–61. https://doi.org/10.1016/j.ejcnurse.2008.04.002.
Santos, A., Martins Ana, A.U., Sousa Carolina, A.U., Vieira Lina, A.U., Grilo Ana, A.U., Carolino Elisabete, A.U., et al., 2018. Eficácia da música no controlo da ansiedade durante o ezxame de PET/TC. Effic. Music anxiety Control Dur. PET/CT scan [Internet] (19), 12–19.
Schneider, N., Bäcker, A., Brenk-Franz, K., Keinki, C., Hübner, J., Brandt, F., et al., 2020. Patient information, communication and competence empowerment in oncology (PIKKO) - evaluation of a supportive care intervention for overall oncological patients. Study protocol of a non-randomized controlled trial. May 15 [cited 2021 Jun 25]. Available from: BMC Med. Res. Methodol. [Internet]. 20 (1), 120 https://pubmed.ncbi.nlm.nih.gov/32414331/.
Shortman, R.I., Neriman, D., Hoath, J., Millner, L., Endozo, R., Azzopardi, G., et al., 2015. A comparison of the psychological burden of PET/MRI and PET/CT scans and association to initial state anxiety and previous imaging experiences. Br. J. Radiol. 88 (1052).
Stanley, B.M., Walters, D.J., Maddern, G.J., 1998. Informed consent: how much information is enough? Available from: Aust. N. Z. J. Surg. 68 (11), 788–791.
Strand, T., Törnqvist, E., Rask, M., Roxberg, Å., 2014. The experience of patients with neoplasm metastasis in the spine during a magnetic resonance imaging examination. J. Radiol. Nurs. 33 (4), 191–198.
Sun, Y., Sun, Y., Qin, Y., Zhang, Y., Yuan, H., Yang, Z., 2020. 'Virtual experience' as an intervention before a positron emission tomography/CT scan may ease patients' anxiety and improve image quality. J. Med. Imaging Radiat. Oncol. [Internet] 64 (5), 641–648.
Topaz, M., Bar-Bachar, O., Admi, H., Denekamp, Y., Zimlichman, E., 2020. Patient-centered care via health information technology: a qualitative study with experts from Israel and the U.S. Informatics. Heal Soc. Care 45 (3), 217–228. https://doi.org/10.1080/17538157.2019.1582055.
Torabizadeh, C., Rousta, S., Gholamzadeh, S., Kojouri, J., Jamali, K., Parvizi, M.M., 2021. Efficacy of education delivery through multimedia and text messaging on the psychological parameters of patients scheduled for coronary angiography: a single-blind randomized controlled clinical trial. BMC Cardiovasc. Disord. [Internet] 21 (1).
Tugwell, J.R., Goulden, N., Mullins, P., 2018. Alleviating anxiety in patients prior to MRI: a pilot single-centre single-blinded randomised controlled trial to compare video demonstration or telephone conversation with a radiographer versus routine intervention. Radiography [Internet] 24 (2), 122–129.
Vieira, Lina, Pires fILIPA, Ana, Grilo Monteiro, Ana, 2021. Anxiety experienced by oncological patients who undergo 18F-FDG PET CT: a systematic review. Radiography 27 (4), 1203–1210.
Vogel, W.V., Valdés Olmos, R.A., Tijs, T.J.W., Gillies, M.F., van Elswijk, G., Vogt, J., 2012. Intervention to lower anxiety of 18F-FDG PET/CT patients by use of audiovisual imagery during the uptake phase before imaging. J. Nucl. Med. Technol. 40 (2), 92–98.
WHO. Patient satisfaction and experience at migrant health centres in Turkey [Internet]. World Health Organization; 2021 Jun [cited 2022 May 24]. Available from: https://www.euro.who.int/en/countries/turkey/publications/patient-satisfaction-and-experience-at-migrant-health-centres-in-turkey-2021.
Wouters, T., Soomers, J., Smink, M., Smit, R.A., Plaisier, M., Houterman, S., et al., 2019. The effect of an animation video on consultation time, anxiety and satisfaction in women with abnormal cervical cytology: animation video reduces colposcopy time. Mar 1 [cited 2021 Jul 8]. Available from: Prev. Med. Rep. [Internet] 13, 238–243 https://pubmed.ncbi.nlm.nih.gov/30719404/.
Xia, T., Zhu, Y.B., Zeng, Y.B., Chen, C., Wang, S.L., Zhao, S.B., et al., 2019. Video education can improve awareness of risks for patients undergoing endoscopic retrograde cholangiopancreatography: a randomized trial. J. Dig Dis. 20 (12), 656–662.