Spinal stenosis patients' visual and verbal description of the comprehension of their surgery

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Abstract

Background

Spine surgery patients have difficulty comprehending the patient education aimed at preparing for surgery.

Purpose

To assess the effect of a specific preoperative education approach (Knowledge Test Feedback Intervention, KTFI) on patients’ verbal and visual understanding of their surgery.

Methods

In this randomized controlled trial, the intervention group (n=50) went through the KTFI and routine education, whereas the control group (n=50) received only routine patient education. Written description of the surgical procedure and drawing of incision were used as outcome measure at baseline, at hospitalization, at discharge and three and six months after surgery.

Results

At the baseline, half of the participants showed verbal and visual understanding of their surgery. During follow-up, understanding improved significantly with no statistically significant differences between the groups.

Conclusion

Spinal stenosis patients’ understanding of their surgical procedure is imperfect. Patient educators need to ensure patients learning by evaluating comprehension outcomes.

Introduction

Patient education is an important component of quality nursing care (Davis, Vincent, Henley, & McGregor, 2013; Leino-Kilpi et al., 2015; Montin, Johansson, Kettunen, Katajisto, & Leino-Kilpi, 2010) which in turn affects patient satisfaction (Davis et al., 2013; Krupic, Rolfson, Nemes, & Kärrholm, 2016; Nilsdotter, Toksvig-Larsen, & Roos, 2009; Papanastassiou, Anderson, Barber, Conover, & Castellvi, 2011). From a patient perspective, comprehending the surgical process has positive outcomes, such as reduced surgery-related anxiety (Kiyohara et al., 2004; Lim et al., 2011; Mulsow, Feeley, & Tierney, 2012), quicker recovery (Trummer, Mueller, Nowak, Stidl, & Pelikan, 2006; Zieren, Menenakos, & Mueller, 2007) and improved sense of empowerment (Johansson, Salanterä, & Katajisto, 2007). However, many patients experience difficulties understanding the education they receive (Engel et al., 2009; Makaryus & Friedman, 2005; Tait, Voepel-Lewis, Chetcuti, Brennan-Martinez, & Levine, 2014). Orthopaedic patients, in particular, have demonstrated a lack of understanding of their planned surgery and its potential complications (Sahin, Oztürk, Ozkan, & Demirhan Erdemir, 2010); many also have difficulty remembering postoperative activity restrictions (Abu Al-Rub, Hussaini, & Gerrand, 2014). Among spine surgery patients, difficulties in comprehending the treatment alternatives or potential risks of the suggested treatment have been demonstrated (Everett et al., 2005); patients may even have misconceptions about the effectiveness of their planned surgery (Franz et al., 2015).

In addition to the aforementioned benefits of pre-operative patient education, healthcare professionals are responsible for ensuring that the patient comprehends the core elements (risks, benefits and alternatives) of the procedure and provided informed consent (Kinnersley et al., 2013; Schenker, Fernandez, Sudore, & Schillinger, 2011) through patient education (Kinnersley et al., 2013).

Empowering patient education aims to increase the individual´s capacity to think critically and make independent informed decisions throughout the pre- and post-surgical phases (Heikkinen et al., 2007; Johansson et al., 2007; Leino-Kilpi et al., 2005; Leino-Kilpi, Luoto, & Katajisto, 1998; Leino-Kilpi, Maenpää, & Katajisto, 1999; Rankinen et al., 2007; Ryhänen et al., 2013). The promotion of patient autonomy is a prerequisite for shared decision making (Fink et al., 2010). In relation to surgical care of patients with lumbar spinal surgery, empowering knowledge covers the following areas: bio-physiological (e.g. etiology, symptoms and care of lumbar spinal surgery), functional (e.g. mobility, rehabilitation, rest, nutrition), social (e.g. family, work), experiential (e.g. emotions, attitude), ethical (e.g. patient rights, participation in decision making, confidentiality), and financial (e.g. costs, social benefits) (Heikkinen et al., 2007; Leino-Kilpi et al., 1998, 1999; Rankinen et al., 2007; Ryhänen, Rankinen, Tulus, Korvenranta, & Leino-Kilpi, 2012) (Table 1). Different education interventions have been described as methods of empowerment, e.g. an Internet-based program in ambulatory orthopaedic surgery (Heikkinen, Leino Kilpi, Nummela, Kaljonen, & Salanterä, 2008), a concept map in joint arthroplasty surgery (Johansson et al., 2007), a knowledge test feedback intervention in spinal stenosis patients before surgery (Kesänen et al., 2016) and in breast cancer patients prior to radiotherapy (Siekkinen, Kesänen, Vahlberg, Pyrhönen, & Leino-Kilpi, 2014).

The present study is part of a larger randomized controlled double-blinded follow-up study to assess the impact of a specific preoperative education intervention (Knowledge Test Feedback Intervention, KTFI) in a group of patients with planned lumbar spine surgery. We have previously tested the impact of KTFI on empowering knowledge level and patient-reported clinical outcomes. The results showed that a KTFI increased spinal stenosis patients´ empowering knowledge level (Kesänen et al., 2016) and relieved preoperative anxiety (Kesänen et al., 2017).

Purpose

In the current study, our purpose was to compare two groups of patients, one that received routine education and one that received routine education and KTFI. The following hypotheses were set: Improved empowering knowledge promotes patient comprehension regarding the surgical procedure such that the patient will be able to (a) more accurately describe the components of the surgical procedure (i.e. what will be done during the surgery), and (b) visualize the surgery by drawing the incision on a human body chart.

Methods

Study Design and Sample

Patients were eligible to participate in this randomized controlled double-blinded follow-up study, if they were adults undergoing surgery for lumbar spinal stenosis, proficient in the Finnish language, and able to use a telephone. The sample size calculation, reported previously elsewhere (Kesänen et al., 2016), determined that a sample of 100 would detect a between group difference and allow for a dropout rate of 15%. One hundred patients were randomized either into the intervention or the control group with 50 patients in each group. The randomization was performed by a research nurse using the minimization method (MINIM® software, (https://www.users.york.ac.uk/~mb55/guide/minim.htm); patients were randomized after they decided to undergo surgery. Throughout the study period, patients and their caregivers were blinded regarding group allocation. The research nurse who conducted first the randomization and then the health education did not take part in the clinical care of the patients.

Routine preoperative patient education

Both groups received routine preoperative patient education, which took place at the outpatient clinic prior to the decision to undergo surgery. The routine preoperative patient education included information on the disease, the treatment options, the surgical procedure, and its risks and benefits. In addition, a staff nurse provided patients with verbal and written education – either face-to-face or by telephone – about how to prepare for the surgery. The physiotherapist educated the patients preoperatively on issues related to postoperative rehabilitation. An anaesthesiologist also met patients before the operation. After the surgery, the surgeon explained the procedure to the patient again and reinforced instructions regarding postoperative rehabilitation. During post-surgical hospitalization, the nurses and physiotherapists continued with verbal and written education about the recovery process.

Intervention (KTFI)

In addition to the routine preoperative patient education, patients in the intervention group received the KTFI Intervention. The KTFI, which took place before the planned surgery, consisted of the KNOWBACK Test and individualized feedback based on the results. A 27-item KNOWBACK

Test was designed for this study to assess patients' empowering knowledge level related to the surgical care of lumbar spinal stenosis (the key points are listed in Table 1). Patients responded to each item with either a "true", "false" or "do not know". A correct answer scored 1 point and a false or do not know answer 0 points for a maximum of 27 points.

Using the results of the KNOWBACK test, individualized feedback was given to the patient prior to the planned surgery. The research nurse conducted the feedback session with the patient via telephone using the concept of empowering discourse (Virtanen et al., 2013; Virtanen, Leino-Kilpi, & Salanterä, 2007). In the beginning of the feedback session, the research nurse aimed to create a comfortable and confidential atmosphere with small talk. The core of the feedback session was based on the KNOWBACK Test results completed at baseline. Correct answers were noted. Incorrect answers were discussed further and, thus, the patient invited to participate in decision-making. A detailed description of the intervention and its impact on the patient knowledge level has been published previously (Kesänen et al., 2016).

Data collection and instruments

Data, including the KNOWBACK Test, was collected at baseline (t0), at admission to hospital (t1), at discharge from hospital (t2) and three months (t3) and six months (t4) after surgery. Data collection t0, t3 and t4 took place at home and t1 and t2 at the hospital. (Figure 1.)

We used the " write-and-draw" method of data collection (Guillemin, 2004). A verbal open-ended question was used to test comprehension of the surgical procedure:"Describe in as much detail as possible the surgery that will be performed/was performed." Patient responses were evaluated as correct or incorrect (incorrect responses included those that were partly-correct and no response), and scored as 1 or 0, respectively. The possible surgical procedures were decompression of the spinal canal with or without fusion of the lumbar spine (either with or without instrumentation). For a correct answer, the patient was required to describe all aspects of the surgical procedure in his/her own words.

The information on visual comprehension was collected by asking patients to draw the incision on a human body chart (Figure 2 and 3). A correct drawing was scored as 1 point, and an incorrect one as 0. The criteria for a correct drawingincluded a 1-2 cm vertical straight line on the middle of the lumbar spine. The drawing of the possible bone harvesting site was not required. The research nurse scored both the verbal and visual understanding according to set criteria, and if uncertain, consulted the surgeon. The demographic characteristics collected were: gender, age, length of basic education, home status (living alone - living with someone), employment status, previous spine surgery (yes - no), previous other surgery (yes - no), duration of hospital stay, and duration of surgery.

Ethics of the Study

The study was approved by the local ethics authority (280/13/03/02/2010). Participants were informed of the study purpose, that their participation was voluntary, that their privacy would be protected, and that their information would be treated confidentially (World Medical Association Declaration of Helsinki, 2013). All participants gave written informed consent. The registration number of this study is ACTRN12611000417987 (Australian New Zealand Clinical Trials Registry).

Data Analysis

Descriptive statistics of demographic factors were presented as means, standard deviations (SD), frequencies and percentages. Differences in demographic factors between the Intervention Group and Control Group were analyzed with t test for numeric variables and chi-square test for categorical variables. The verbal and visual comprehension of the surgical procedure were analyzed with two-way repeated-measures analysis of variance (ANOVA) with the group as a between-subject factor, and time point (t0, t1, t2, t3, and t4) as a within-subject factor. The potential effect of the demographic characteristics was adjusted for by using these variables as covariates in the analysis. In addition, the groups were compared with t-test in each measurement point and the repeated-measures ANOVA was performed separately in both groups. The data were analyzed using SAS 9.3 software (SAS Institute Inc., Cary, NC, USA). P values less than 0.05 were regarded as statistically significant. To illustrate the results, we also report examples of the original visual and verbal data, including incorrect descriptions.

Results

Participants

Overall, 100 participants were allocated to the two study groups (Intervention Group: n = 50; Control Group: n = 50), and the overall dropout rate at the six-month follow-up was 13 % (Figure 1). The demographic or surgical characteristics did not show any significant difference between the study groups (Table 2).

Verbal comprehension of the surgical procedure

At baseline, approximately half of the patients in both study groups could describe their surgical procedure (decompression, fusion with or without instrumentation) correctly. At final follow-up (six months after the surgery) patients in both study groups showed improvement in this respect compared to baseline (time effect $p < 0.0001$), although a quarter of the patients still could not correctly describe the main aspects of their surgery. No significant differences between the study groups were noticed at any of the data collection points (group*time effect $p = 0.6206$). None of the demographic characteristics had an effect on verbal comprehension. (Table 3.)

The following examples illustrate a correct description of the surgical procedure (ID 102, female, 74 years):

> *"Severe degree spinal stenosis, spinal canal very narrow, nerves in the lower lumbar spine lumped together, almost no spinal fluid, the surgery will increase the size of the spinal canal, and the nerves will be loosened from each other".* (At baseline, after decision to undergo surgery, t0)

> *"The space in the two lowest spinal canals is widened by carving bone, thus making room for the nerves to function."* (At admission to the hospital, t1)*"*

"After the skin and muscle incision, bone was carved from two to three lumbar vertebrae which created more room for the nerves. The nerves were compressed, and there was very little spinal fluid down there". (At discharge from hospital, t2)

The following examples illustrate an incorrect description of the surgical procedure (ID 94, male, 76 years)

"Spine operation, no other information". (At baseline, after decision to undergo surgery, t0)

"I forgot already what the surgeon said me". (At admission to the hospital, t1)

Visual comprehension of the surgical procedure

At baseline 60 % of patients in both study groups could draw the location and length of the incision correctly ($p = 1.0$). At final follow-up (six months after the surgery, t3) 90% of patients in both study groups performed this task correctly (time effect $p < 0.0001$). There were no significant differences between the study groups at any of the data collection points (group*time effect $p \geq 0.6183$). None of the collected demographic characteristics had an effect on visual comprehension. Figure 2 illustrates a correct drawing. In the incorrect drawings (Figure 3), the incision could be horizontal, too long, or incorrectly placed (e.g. covering almost the whole back or situated lateral to the spine).

Discussion

Patients' comprehension of their surgical procedure increased significantly in both study groups during the follow-up. Three months after the operation, 75% of patients could describe their surgical procedure and almost all patients could draw the wound correctly. This is probably more due to having gone through the surgical care process than the patient education *per se*. However, it is remarkable that at admission to the hospital, approximately half of the patients did not comprehend the planned treatment. Furthermore, after surgery about 25 % of patients still did not comprehend the treatment they had gone through. A previous study suggested that time in patient education session increases patient comprehension (Fink et al., 2010). There is no way of knowing if this was the case as we did not standardize the routine education, so there may have been variations in messages between educators. Furthermore, this could have been due to inadequate patient education, or the complexity of the anatomy of the surgical site. We also found that the KTFI clearly increased patient empowering knowledge level but the KTFI had no effect on patient comprehension of their surgical procedure. In designing the current study, we hypothesized that higher empowering knowledge level would promote patient comprehension of the planned surgical procedure. The KTFI did not include feedback of surgical procedure, possibly due to study design.

Our results showed a general lack of patient knowledge of the surgical procedure. This – combined with the fact that an understanding of the surgical procedure is a requirement for informed consent (Kinnersley et al., 2013) – underscores the importance of developing and implementing effective education methods covering the whole surgical process. Furthermore, many positive patient outcomes have been reported with improved comprehension of the surgical procedure: reduced anxiety (Bong & Park, 2006; Kiyohara et al., 2004), stronger role for the patient in shared decision-making (Deyo et al., 2000; Lurie et al., 2011; McGregor, Henley, Morris, & Doré, 2012), and faster recovery (Rolving et al., 2015, 2016). In spine surgery, an understanding of the treatment may support postoperative rehabilitation and self-care and rationalize the necessary activity restrictions. It is the responsibility of health care professionals to ensure that patients comprehend their surgical procedure.

The KTFI can be easily modified according to individual patient needs. Our assumption was that KTFI increases patient comprehension of the surgical procedure. As far as verbal and visual understanding of the procedure goes, we could not confirm this with the current study design. This may be because we did not take into account each individual patient´s learning strategies; neither did we assess whether they memorized (knowledge acquisition) or comprehended the education and its context (deep learning) (Pask, 1988). Comprehension or deep learning helps patients adapt knowledge to new situations (Bastable, 2008) and prepares the patient for decision-making, surgery and the recovery phase. In our study, the preoperative patient education intervention significantly increased patient knowledge level (Kesänen et al., 2016); however, this did not seem to lead to an improved understanding of the surgical procedure. The same phenomenon has been detected in other patient education interventions (Kesänen, Leino-Kilpi, Arifulla, Siekkinen, & Valkeapää, 2014). Clearly, there is a need for future research on novel patient education methods to better meet learning preferences and needs, and systematically assess comprehension.

As a means to analyze comprehension, we asked patients to verbally and visually (”write and draw”) describe their surgical procedure. The ”write-and-draw” technique is based on the teach-back educational method where patients are asked to explain in their own words the concepts that they have been taught (Caplin & Saunders, 2015). Although pain drawings have been used in clinical practice and research to assess back pain patients (Öhlund, Eek, Palmblad, Areskoug, & Nachemson, 1996) to our knowledge, neither drawings nor verbal descriptions have previously been used to assess back surgery patients’ comprehension of their surgical procedure. Thus, we see the ”write-and-draw” method as a valuable tool to individualize patient education.

Validity

To the authors´ knowledge no other study has tried to assess adult patient comprehension of their spine surgery. The validity of our study is supported by several factors. The study was a randomized controlled trial with two balanced study groups. The dropout rate was low. Healthcare professionals were not aware of the group allocation and thus provided similar clinical care to all patients. Nor did the patients know their group allocation; the control group received a general telephone call to ensure blinding. One nurse conducted all the interventions to ensure standardization.

Our study has some limitations. The generalization of results to other patient populations needs consideration because the patients in the current study were younger (Lurie et al., 2011; Strömqvist, Fritzell, Hägg, Jönsson, & Sandén, 2013) and the percentage of females was higher compared to previous international studies (Otani et al., 2013) and national statistics (National Institute for Health and Welfare, 2016).

Furthermorewe could not control for the effect of independent information seeking using the Internet or other sources of information. For example, in the verbal assessment, patients were asked to describe the surgical procedure in their own words. After the surgery some patients used very professional language, which probably came from the operation report they received after the surgery.

In health care, drawings have been used to describe patient perceptions especially in children and adolescents (Guillemin, 2004; Pelander, Lehtonen, & Leino-Kilpi, 2007; Sakellari, Lehtonen, Sourander, Kalokerinou-Anagnostopoulou, & Leino- Kilpi, 2014). Drawings have also been used to assess how adult patients with heart disease (Guillemin, 2004; Reynolds, Broadbent, Ellis, Gamble, & Petrie, 2007), cancer (van Leeuwen, Herruer, Putter, van der Mey, & Kaptein, 2015) and chronic obstructive pulmonary disease (Luthy et al., 2013) understand their health problem. In spine surgery, pain drawings are mainly used to assess back pain (Haefeli & Elfering, 2006) and they can be analyzed quantitatively (Öhlund, Eek, Palmblad, Areskoug, & Nachemson, 1996). In the current study, we used the human body chart to assess patient understanding of surgery site. The drawing method was simple to use and the scoring criteria easy to implement. Our results show that besides exploring patient perception and experience, drawings can be used in addition to verbal communication to assess patient understanding of care (Guillemin, 2004).

Conclusion

Spinal stenosis patients' comprehension of their surgical procedure is imperfect. Health care professionals are responsible for ensuring that patients understand their surgical procedure. Thus, effective patient education interventions are needed. Furthermore, assessment of patient education outcomes is essential.

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Table 1. Empowering knowledge defined in the KNOWBACK Test

Dimension (subscale)	**Content**
Bio-physiological	Ethiology, symptoms and prognosis of the disease; risks, perceived benefits, expected outcome and alternative treatments for any given procedure
Functional	Mobility, rehabilitation, daily activities, rest and nutrition
Social	Family and significant others, work and patient unions
Experiential	Emotions and attitude
Ethical	Patient rights, participation in decision making and confidentiality
Financial	Costs and social benefits

Table 2. Demographic characteristics of the participants at baseline (n = 50 in IG; n = 50 in CG)

	IG % (n)	CG % (n)	P-value
Gender			
Male	34 (17)	38 (19)	0.677*
Female	66 (33)	62 (31)	
Age [a]			
Mean age years (SD)	61.9 (12.5)	63.0 (11.9)	0.654†
Basic education			0.879*
Six years or less	32 (16)	32 (16)	
Nine years	42 (21)	46 (23)	
Twelve years	26 (13)	22 (11)	
Home Status			0.091*
Living alone	24 (12)	30 (15)	
Living with someone	76 (38)	70 (35)	
Employment status			0.259*
Employed	30 (15)	26 (13)	
Retired	58 (29)	70 (35)	
Other	12 (6)	4 (2)	
Previous spine surgery	34 (17)	33 (16)	0.986*
Previous other surgery	80 (39)	92 (45)	1.000*

IG =n intervention group, CG = control group

[a] Mean values (standard deviation), *Pearson Chi-square for comparing proportions, † Student's *t* test for independent samples

Table 3. The percentages of correct answers of verbal and visual understanding of the surgical procedure adjusted for all covariates (age, gender, duration of hospital stay, duration of surgery and knowledge at baseline)

	t0		t1		t2		t3		t4			
Group	% (SE)	n	% (SE)	n	% (SE)	n	% (SE)	n	% (SE)	n	p_{time}	$p_{group*time}$
Verbal description												
Intervention	58 (6)	48	48 (6)	49	65 (6)	48	69 (7)	44	64 (7)	44	<0.0001	0,6206
Control	43 (7)	49	61 (7)	49	68 (7)	46	74 (7)	40	64 (7)	35		
p_{group}	0,68		0,85		1		1		1			
Visual description												
Intervention	59 (6)	48	66 (6)	49	82 (6)	48	95 (6)	44	91 (6)	44	<0.0001	0,6183
Control	58 (6)	49	54 (6)	49	81 (6)	46	90 (7)	40	87 (7)	35		
p_{group}	1		0,87		1		1		1			

SE = standard error

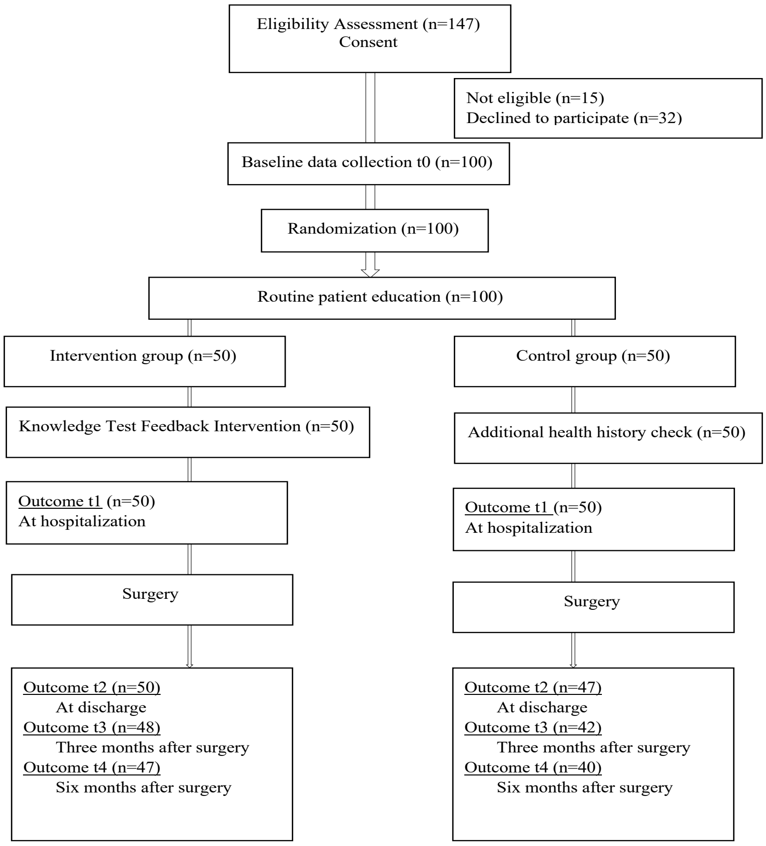

Figure 1. Study design and flow

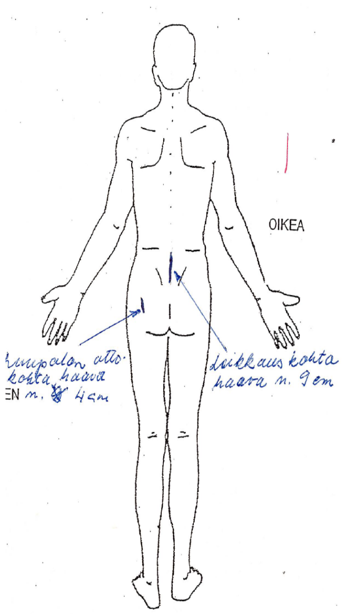

Figure 2. An example of a correct drawing of location and length of incision. The text on the left hand side: *"Bone harvesting wound about 4 cm"* and on the right hand side: *"Operation wound about 9 cm"*.