

## Patient Education May Improve Perioperative Safety

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### Abstract

**Importance:** There is a growing interest in enabling ways for patients to participate in their own care to improve perioperative safety, but little is known about the effectiveness of interventions enhancing an active patient role.

**Objective:** To evaluate the effect of patient participation on perioperative safety.

**Evidence review:** We conducted a systematic review by searching the Cochrane, PubMed and EMBASE databases without a time limit for publications on the effect of patient-related interventions on perioperative safety. We included randomized controlled trials, quasi-experimental studies and cohort studies. The included studies were analyzed for type of intervention, safety outcomes, effects and quality.

**Results:** Thirteen studies were included: eight RCT's, four cohort studies and one quasi-experimental study. All studies concerned a preoperative structured educational intervention on postoperative self-management activities of patients, such as everyday movements, coughing, getting out of bed or exercising. Safety outcomes were complications, in-hospital falls and mortality. Results from eleven studies indicate positive effects of such patient-related interventions.

**Conclusion and relevance:** Patients appear able to improve their perioperative safety by participating in preoperative structured educational programs about postoperative regimes. Educational programs on self-management activities should be integrated in the preoperative trajectory. Further research should address the most effective components and timing of education, explore other kinds of patient involvement and link the robustness of the intervention, e.g. in terms of behavior change, to perioperative patient safety outcomes.

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### Background

About half of the adverse events (AEs) among inpatients are associated with surgical procedures<sup>[1,2]</sup> Surgical AEs are considered preventable in more than half of the cases (54 - 74%)<sup>[1]</sup>. Many interventions to increase perioperative patient safety address the health care process or the health care professional e.g., a surgical safety checklist<sup>[3,4]</sup> Recently there has been more attention paid to the role patients can play regarding their own safety<sup>[5]</sup>. Patients are the only individuals physically present during every treatment and consultation. This makes them valuable to play a role in increasing the safety in their own care process<sup>[6]</sup>. Many initiatives are developed to promote patient participation aiming to improve their safety, for example “20 tips to prevent medical errors”<sup>[7]</sup> and the “speak up” initiative of the Joint Commission<sup>[8]</sup>. Some have tried to identify the ways for patients to improve their own perioperative safety. For example, the Health Foundation identified five categories of patient focused interventions that could enhance patient safety; viz by involving patients in improving infection-control, increasing adherence to treatment regime, inviting them to report adverse drug events, equipping them for safer healthcare and preventing wrong-site surgery<sup>[5]</sup>. Davis et al.<sup>[9]</sup> tried to identify

all of the possible interventions for surgical patients that could enhance their own safety: choosing a health care provider, undertaking a smoking cessation program, asking questions about recovery, and notifying staff when their wounds becomes infected. The timing of the intervention has been studied as well; Gillis et al.<sup>[10]</sup> demonstrated that there was no significant difference in complication rate between prehabilitation and rehabilitation.

Although literature demonstrates that there is a huge interest in the potential for involving patients in promoting their own safety, the benefits are still unclear<sup>[10,11]</sup>. Alcohol and smoking cessation programs for which several systematic reviews have been performed<sup>[12-16]</sup> have shown that preoperative cessation decreases the risk of post-operative complications. We therefore aimed to review the literature on the effect of other patient-related interventions that stimulate an active role of the patient to improve surgical patient safety and to generate recommendations with respect to the interventions that are proven effective in increasing perioperative safety.

## Methods

### Data sources

We searched for English or Dutch published studies, using the Cochrane Library, EMBASE and PubMed databases, without publication year limitations. The references of the included studies were manually checked to identify additional relevant studies that were missed in the initial database search. "Appendix 1" and "Appendix 2:" provides a detailed list of search strings.

### Selection of studies

Two authors (LH and HC) independently assessed inclusion eligibility of the studies by title and abstract. If there was no abstract available only the title was assessed. Differences in inclusion eligibility were solved by discussion. Full text articles were retrieved for the eligible studies. The initial agreement of the two authors on full text retrieval was 96.4%. For the final selection full text copies were examined to determine whether they fulfilled the inclusion criteria. Disagreement was settled by discussion with the third author (AW).

The studies had to meet four inclusion criteria. First, the participants had to be surgical patients. Second, the study needed to investigate the effect of interventions regarding active involvement of patients, potentially with help of a health care professional. Third, the outcome had to be related clearly to safety and should be appropriately reported. Following the IOM definition we described safety as the prevention of harm to patients<sup>[17]</sup>. We thus searched for safety outcomes such as adverse events, medication errors and complications. Side effects such as nausea, vomiting and difficulty to swallow were not considered to be safety related and therefore excluded. Finally, the full text had to be written in English or Dutch and should be available. Studies addressing alcohol and smoking cessation programs were excluded because of the availability of systematic reviews. After evaluating the full text articles, a manual cross-reference search of eligible articles obtained for full-text evaluation was undertaken.

### Quality assessment

The included full text articles were assessed for meth-

odological quality by LH and HC, disagreement was settled by discussion. The Cochrane Groups pre-designed table<sup>[18]</sup> was used and modified to ensure standardized scoring for all included studies and to summarize their quality. The quality criteria included randomization, allocation, blinding, similarity of groups, and description of inclusion and exclusion criteria, power analysis, and intention to treat analysis and lost to follow up characteristics. Studies scored 1 point for each fulfilled criterion. If a criterion was not applicable, the item was labeled "NA". If the information was unclear or not reported, the item was labeled "No", both resulting in zero points.

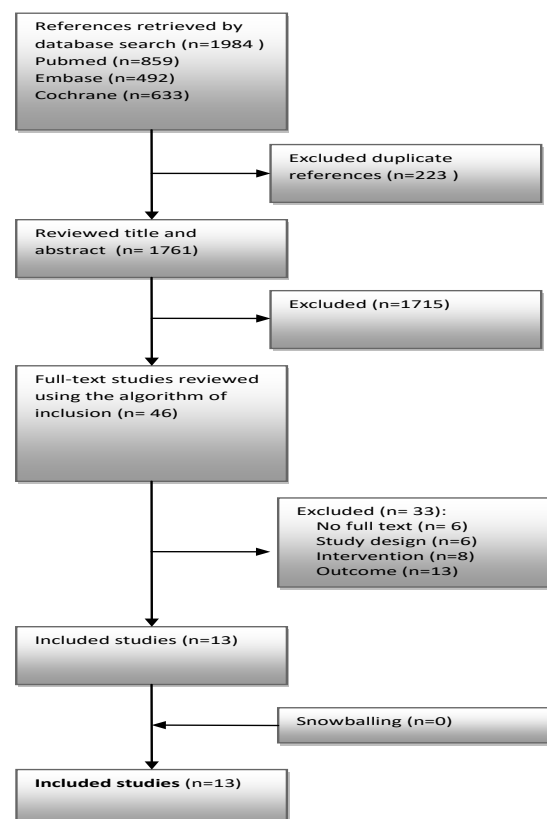
### Data extraction and analysis

Data were extracted from the included studies. First, descriptive characteristics such as year of publication, design, country, and type of surgery were collected. Second, the data for analysis were retrieved. We described the number of participants, the intervention, the relevant outcome and statistical significance.

## Results

### Search results

In total 1,984 references were retrieved by the searches (Figure 1). Forty-six references were identified as potentially relevant and 13 studies met the inclusion criteria. Reasons for exclusion were: inappropriate study design to measure intervention effect (n = 6), the intervention did not involve active patient participation (n = 8), the outcome was not related to safety (n = 10) or was not clearly described (n = 3) and no possibility for obtaining a full text copy (n = 6). Checking the references of the included studies did not yield additional studies.



**Figure 1:** Flow chart of identification of relevant studies.

### Characteristics of the included studies

**Background characteristics:** Thirteen individual studies were included: eight randomized controlled trials, one quasi-experimental study and four cohort studies (Table 1). The majority of the studies were conducted in North America (six in the USA and two in Canada). All studies concerned adult patients. The sample sizes ranged from 12 to 656 in the intervention group and from 20 to 1,945 in the control group. The majority of the studies included patients undergoing orthopedic surgery and cardiothoracic surgery.

**Table 1:** Characteristics, intervention and results of included studies.

Year, Author (reference)	Design	Country	Type of surgery	Participants, n		Intervention	Results			Significance
				Intervention group	Control group		Outcome Control n(%)	Intervention n(%)		
2013, Mayich D.J. <sup>[20]</sup>	RCT	Canada	Ankle Fracture surgery	20	20	Information package containing an educational handout and a handout about self-administered physiotherapy	Complications	4(20%)	2(10%)	Not significant P 0.22
2012, Clarke H.D. <sup>[22]</sup>	Cohort study	USA	Total knee arthroplasty	72	172	Pre-operative 15-30 minutes educational program that addresses fall-prevention including a patient educational sheet within 14 days before surgery	In-hospital falls	0(0%)	7 (4.1%)	Significant : P 0.03
2011, Kearney M. <sup>[28]</sup>	Cohort study	USA	Elective single joint total hip or knee replacement	88	62	Structured pre-operative educational class (face to face class or online)	Complications	4(4.5%)	8(12.9%)	Not significant P 0.06
2009, Lübbecke A. <sup>[25]</sup>	Cohort study	Switzerland	Primary total hip arthroplasty	656	1945	3 hour educational session including muscle strengthening exercises and post-operative restrictions of range of motion instructions	Dislocation of the hip within 6 months after surgery	5(0.8%)	41(2.1)	Significant P 0.02
2006, Deyirmenjian M. <sup>[29]</sup>	RCT	Lebanon	Coronary artery grafting	57	53	Education session and demonstration of leg and respiratory exercises	Complications	13(22.8%)	9(16.98%)	Not significant P 0.34
2005, Blay N. <sup>[6]</sup>	RCT	Australia	Laparoscopic cholecystectomy	41	52	Verbal education about wound care, diet, activity, bowel management and management of medical complication	Wound infections	1(2.4%)	10(19.2%)	Not reported
2005, Siggeirsdottir K. <sup>[17]</sup>	RCT	Iceland	Total hip replacement	27	23	Pre-operative education and training program about post-operative rehabilitation, information brochure about exercise after the operation and a rehabilitation scheme	Complications	5(18.5%) Patients had 9 complications	11(47.8%) Patients had 12 complications	Not significant P 0.3

1997, Bass E.M. <sup>[19]</sup>	cohort	USA	Elective stoma placement	292	301	Stoma education and stoma marking	Early (< 1 month) and late (> 1 month) complications	Early: 68(23.3%) Late: 27 (9.3%) Total 91 (31.2%)	Early: 95(31.6%) Late: 36(12%) Total 117 (38.9%)	Significant: P<0.01
1994, Meeker B.J. <sup>[26]</sup>	Quasi experimental	USA	Elective general surgery, urological surgery or colorectal surgery	49	95	Structured pre-operative teaching program	Atelectasis	9 (18.3%)*	5 (5%)	Significant** P 0.015
1991, Hancharunrui S. <sup>[27]</sup>	RCT	Thailand	Pyelolithotomy or nephro-lithotomy	20	20	Nurse led self-care program, patients learned and practiced deep breathing, effective coughing, leg exercises, turning, changing position, getting out of bed and methods of pain relief	Complications	1(5%)	3(15%)	Significant P 0.01
1987, Anderson E.A. <sup>[24]</sup>	RCT	USA	CABG	20 Information 20 Information and coping	20	Information: detailed information, watch video and listen to audio tape Information and coping: as information group and taught exercises by watching slide show and practicing	Acute postoperative hypertension	Information: 9(45%) Information and coping 8(40%)	15(75%)	Significant P<0.02
1976, Felton G. <sup>[23]</sup>	RCT	USA	Mayor surgery	25 Experimental 12 Communication	25	Experimental: education with films, photo's, postoperative exercise and breathing techniques instructions Communication group: therapeutic communications session	Pulmonary or circulatory complications	Experimental: 20 (80%) Communication: 7(50%)	24(92%)	Not reported
1976, Fortin <sup>[21]</sup>	RCT	Canada	Elective major intra-abdominal or intra-thoracic surgery	37	32	Structured preoperative educational program including respiratory muscular exercises, techniques of changing position and suggestions of self-care	Re-admission by complication; Death	0 (0%) Readmission or deaths	0(0%) Re-admission or deaths	Not reported

\*According to the authors 9 of the 49 patients had atelectasis which would sum up to 9.5%

\*\* According to the authors the difference between the two groups was not significant (P value 0.01)

**Patient-related interventions:** All of the included studies investigated the effect of an educational intervention addressing topics as postoperative self-management, postoperative exercise, and everyday movements after surgery and breathing techniques. Handouts were given in some studies (n = 3), in one study the optimum stoma location was determined together with the patient and advice was given about stoma management<sup>[19]</sup>. In most studies education was given in a more or less structured manner, example by providing an educational class or a private session. In one study an additional information package was provided containing two educational handouts<sup>[20]</sup>.

**Outcome measures:** Safety outcomes were mortality or readmission by complications<sup>[21]</sup> and in-hospital falls<sup>[22]</sup>. In the other studies (n = 11) different types of postoperative complications were measured, for example pulmonary complications<sup>[23]</sup>, acute postoperative hypertension<sup>[24]</sup>, dislocation of the hip<sup>[25]</sup> or wound infections<sup>[6]</sup>.

**Quality of the studies**

The quality of the studies included was variable (Table 2). Overall, the randomized controlled trials scored higher than the quasi-experimental or cohort studies. In all studies inclusion and exclusion criteria were specified. In three studies the intervention and control group were not comparable at baseline; In one study the ASA-score in the intervention group was higher compared to the controls<sup>[26]</sup>; In another study participants in the control group had significantly lower ASA-scores, were more often operated by more experienced surgeons and had better pre-operative function scores<sup>[25]</sup>. A third study showed an unequal distribution of stoma types in their study groups<sup>[19]</sup>. None of the studies contained a power analysis nor an intention-to-treat analysis on the outcome we were studying.

**Table 2:** Quality assessment of included studies.

	Year, Author	Ran-domi-za-tion	Allo-ca-tion ce-a-led	Simi-lar-ity of groups at baseline <sup>1</sup>	Inclu-sion/ ex-clu-sion criteria specified <sup>1</sup>	Assessors blinded to out-come	Attri-tion rate reported	Charac-ter-istics of parti-ci-pants lost to follow up described <sup>1</sup>	Inten-tion to Treat analy-sis* <sup>1</sup>	Power analysis calculat-ed <sup>1**</sup>	Total (max-imum score)
Random-ized con-trolled trials	2013, May-ich DJ.	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	6(9)
	2005, Blay N.	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	5(9)
	2005, Sig-geirsdottir K.	Yes	Yes	Yes	Yes	No	Yes	No	No	No	5(9)
	1991, Hanucharu-rnkui S.	Yes	Yes	Yes	Yes	No	Yes	NA	No	No	5(8)
	1987, An-derson E.A.	Yes	No	Yes	Yes	Yes	Yes	NA	No	No	5(8)
	1976, Felton G.	Yes	No	Yes	Yes	No	No	NA	No	No	3(8)
	1976, Fortin	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	6(9)
Quasi-expi-ri-mental	2006, Dey-irmenjian M.	Yes	Yes	Yes	Yes	Yes	No	NA	No	No	5(8)
	1994, Meecker B.J	No	No	No	Yes	No	No	NA	No	No	1(8)
Cohort studies	2012, Clarke H.D.	Na	NA	Yes	Yes	No	NA	No	NA	No	2(5)
	2011, Kear-ney M.	NA	NA	Yes	Yes	No	NA	NA	NA	No	2(4)
	2009, Lüb-beke A.	NA	NA	No	Yes	Yes	Yes	No	NA***	No	3(6)
	1997, Bass E.M.	NA	NA	No	Yes	No	No	NA	NA	No	1(5)

NA: Not applicable

Unknown or unclear was labeled as No

1: added quality criteria by authors

\* The intention to prevent harm

\*\* Power analyses of outcome of our interest

\*\*\* Number needed to treat is calculated

**Effects of interventions**

Five studies showed significant effects on patient safety by decreasing the number of post-operative complications<sup>[19,24,25,27]</sup> or in hospital falls<sup>[22]</sup> (Table 1). Four of these studies<sup>[22,24,25,27]</sup> concerned an educational intervention regarding self-care or post-operative exercises, measuring effects on hip dislocation, post-operative complications or in hospital falls.

The fifth study<sup>[19]</sup> concerned education about stoma care, the patient learnt what a stoma was and received accurate information about living with a stoma. Together with the patient the optimum location for the stoma was marked. This intervention decreased early and overall complications but not the late complication rate. In two studies<sup>[6,23]</sup> educating the participants in self-care or exercises seemed to improve patient safety, although the significance was not mentioned. In one study<sup>[21]</sup> deaths or readmissions by complication did not occur and there by the effect on safety could not be evaluated.

In four studies no significant improvement in patient safety could be shown, although two of these studies<sup>[17,28]</sup> did demonstrate a non-significant improvement. One study<sup>[26]</sup> demonstrated an unexpected significant decrease in patient safe-

ty; participants in a preoperative teaching program had a higher incidence of atelectasis than the non-participants. The higher ASA-score of the participants compared with the non-participants may be the reason for this.

## Discussion

Our systematic review suggests that patients may influence safety outcomes after surgery if they participate in a structured educational program. Teaching patients how to move, self care, breath and exercise after surgery seems to help reduce complications, in-hospital falls and hip dislocations after surgery. All of our studied interventions involved pre-operative educational programs. The measured safety outcomes concerned several kinds of complications. In most of the studies the outcome of increased safety was not defined as a primary outcome and therefore lacked adequate power to demonstrate statistically significant effects. We therefore performed a meta-analysis including 6 RCTs (excluding 2 RCTs<sup>[21,29]</sup>, respectively for reasons of no complications in both the intervention and control group in one study, and presenting the number of complications instead of the number of patients with complications in another study). This meta-analysis revealed no robust statistical significance but showed that pre-operative patient education tends to reduce the occurrence of postoperative complications (RR 0.64; 95% CI 0.35 - 1.15;  $p = 0.08$ ). It must be noted that because of the different types of reported postoperative complications and types of surgery we used a random effect model instead of the default 'fixed effect model' to estimate the single risk ratios and the overall effect. Using a random effect model results in a larger confidence interval of the overall effect<sup>[30]</sup>, thereby not revealing a statistically significant effect.

Our results are in line with the results of systematic reviews about smoking and alcohol cessation programs<sup>[12-15]</sup>, which demonstrate that these programs are beneficial in reducing post-operative complications. The educational programs in our review, however, varied in content because of the different surgeries, but shared a focus on aspects of postoperative self-management. Despite a lack of precise insight into the intensity of education and extent of participation of patients, we do know that the educational interventions were given by health care workers in a structured way and patients had the opportunity to practice the exercises, and proceedings were learned under supervision of an expert. Just providing patients with information sheets, without further explanation, does not seem to increase patient safety<sup>[20]</sup>.

Explanations provided for the ineffectiveness of interventions vary and include a possible lack of compliance with the given recommendations<sup>[20]</sup>, inexperienced staff<sup>[20]</sup>, cultural differences where the physician is expected to make the decisions<sup>[29]</sup> and inappropriate timing of applying the intervention example the day before surgery, when patients are too apprehensive to listen<sup>[29]</sup>. One study<sup>[26]</sup> showed an unexpected significant decrease in perioperative safety, but this effect may be attributed to a higher ASA-score in the intervention group. In addition, we found miscalculations and ambiguities in the results and therefore considered this study less reliable.

The evidence identified in our review does not address all potential areas of patient involvement in perioperative safety. For example, we did not find studies on enabling surgical

patients to choose their health care worker, patients questioning hand hygiene or patient reporting of adverse drug events, examples of interventions that were suggested by the Healthcare Foundation<sup>[5]</sup> and Davis et al.<sup>[9]</sup>. We found some studies investigating other interventions, for example Bergal et al.<sup>[31]</sup>, who studied an intervention to prevent wrong site surgery by patients asking to mark the site of operation with "Yes". Jangland et al.<sup>[32]</sup> studied the "Tell-us" card, which patients could use to write down their specific questions and concerns for the day of or before discharge. However, these studies did not evaluate the effect on safety outcomes and were therefore excluded from our review.

A limitation of our review method is that we searched the major databases. We did not search lesser known databases nor did we do a hand search of the journals where the included studies were published. We tried to overcome this limitation by checking the references of included articles for potential relevant studies. Also, no attempts were made at collecting unpublished data nor do we have any information about potential publication bias. On the other hand, strength of our review method is that we did not use a time limit yielding some interesting studies that otherwise would not have been included. Another limitation is that we did not systematically collect data from the included studies about behavior change, extent of participation of patients or process measures about the extent of success of the educational intervention reflecting the robustness of the intervention. Using this kind of information would have been more precise in assessing the impact on the safety outcomes of our interest.

To our knowledge, outside alcohol and tobacco cessation, no previously study has reviewed the effects of patient participation on perioperative patient safety. Based on these results, we recommend that patients should be active in their own care trajectory which can be encouraged by inviting and stimulating them to join a structured educational program on self-management activity. In this way, patients may contribute to improve their own perioperative safety.

## Conclusion

Active patient participation in education programs on how to manage the postoperative situation can improve patient safety. The potential difficulties with daily activities and breathing compared to the situation before surgery should be explained. In line with the proven beneficial results of smoking and alcohol cessation program, these educational interventions may be most effective when given in a structured way, resulting in fewer in-hospital falls, hip dislocations and other post-operative complications. Future studies should address the most effective components and timing of education, explore the effects of other patient-related interventions, for example the use of patient safety cards aimed at helping patients to safeguard their perioperative care trajectory, and should link the robustness of the intervention, example in terms of behavior change, to safety outcomes, such as complications, mortality, medication errors or other adverse events.

**Conflicts of Interest:** Authors declare no conflicts of interest.

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## Appendix 1: Search strings by Database

### PubMed:

(“Consumer Participation”[Mesh] OR patient participation [mesh] OR Pamphlets [Mesh] OR (“Patient Education as Topic”[Majr] OR (“Patient Education as Topic/education”[Mesh] OR “Patient Education as Topic/methods”[Mesh] OR “Patient Education as Topic/standards”[Mesh] OR “Patient Education as Topic/utilization”[Mesh] )OR Consumer Health Information [Mesh] OR “Audiovisual Aids”[Mesh] OR Consumer Participation [tiab] OR Patient Participation [tiab] OR patient involvement[tiab] OR consumer involvement [tiab] OR Pamphlets [tiab] OR Consumer Health Information [tiab] OR Educational Technology [tiab] OR audiovisual aids [tiab] OR user participation [tiab] OR client participation [tiab] OR citizen participation [tiab] OR public participation [tiab] OR caregiver participation [tiab] OR parent participation [tiab] OR relative participation [tiab] OR user involvement [tiab] OR client involvement [tiab] OR citizen involvement [tiab] OR public involvement[tiab] OR caregiver involvement [tiab] OR parent involvement [tiab] OR relative involvement [tiab] OR ipad [tiab] OR handout\* [tiab] ) AND (“Surgery Department, Hospital”[Mesh] OR “Operating Rooms”[Mesh] OR “Preoperative Care”[Mesh] OR “Perioperative Care”[Mesh] OR “Postoperative Care”[Mesh] OR “Intraoperative Period”[Mesh] OR “Postoperative Period”[Mesh] OR “Perioperative Nursing”[Mesh] OR “Anesthesia and Analgesia”[Mesh] OR Anesthetics[Mesh] OR surger\*[tiab] OR surgic\*[tiab] OR Operating Room[tiab] OR Operating Rooms[tiab] OR preoperative[tiab] OR preoperative [tiab] OR perioperative[tiab] OR intraoperative[tiab] OR postoperative[tiab] OR Anaesthesia [tiab] OR Anesthesia[tiab] OR Anaesthetics[tiab] OR Anesthetics[tiab] OR Analgesia[tiab] OR postanesthesia [tiab] OR Recovery room[tiab] OR

Recovery rooms[tiab] OR PACU[tiab]) AND (“Safety”[Mesh] OR “Retreatment”[Mesh] OR “Mortality”[Mesh:noexp] OR “Fatal Outcome”[Mesh] OR “Survival Rate”[Mesh] OR “Intraoperative Complications”[Mesh] OR “Postoperative Complications”[Mesh] OR “Health Status Disparities”[Mesh] OR “Safety Management”[Mesh] OR “Medical Errors”[Mesh:NoExp] OR “Medication Errors”[Mesh] OR “Retreatment”[tiab] OR “hospital mortality”[tiab] OR “operative mortality”[Tiab] OR “peroperative mortality”[Tiab] OR “perioperative mortality”[Tiab] OR “postoperative mortality”[Tiab] OR “Fatal Outcome”[tiab] OR “Survival Rate”[tiab] OR Surgical Wound Infection[tiab OR “Health Status”[tiab] OR “Recovery of Function”[tiab] OR “Patient Safety”[tiab] OR “Safety Management”[tiab] OR “adverse effect”[tiab] OR “adverse effects”[tiab] OR Incident[tiab] OR incidents[tiab] OR Medical Errors [Tiab] OR Medication Errors [Tiab])

Limits: Dutch, English, Humans

Hits: 859

### Cochrane Library:

(Consumer Participation[Mesh] OR patient participation [mesh] OR Pamphlets [Mesh] OR Patient Education as Topic [Mesh] OR Consumer Health Information [Mesh] OR Audiovisual Aids [Mesh] OR Consumer Participation .ti,ab,kw. OR Patient Participation .ti,ab,kw. OR patient involvement.ti,ab,kw. OR consumer involvement .ti,ab,kw. OR Pamphlets .ti,ab,kw. OR Consumer Health Information .ti,ab,kw. OR Educational Technology .ti,ab,kw. OR audiovisual aids .ti,ab,kw. OR user participation .ti,ab,kw. OR client participation .ti,ab,kw. OR citizen participation .ti,ab,kw. OR public participation .ti,ab,kw. OR caregiver participation.ti,ab,kw. OR parent participation .ti,ab,kw. OR relative participation .ti,ab,kw. OR user involvement .ti,ab,kw. OR client involvement .ti,ab,kw. OR citizen involvement .ti,ab,kw. OR public involvement.ti,ab,kw. OR caregiver involvement .ti,ab,kw. OR parent involvement .ti,ab,kw. OR relative involvement .ti,ab,kw. OR ipad .ti,ab,kw. OR handout\* .ti,ab,kw.) AND (Surgery Department, Hospital [Mesh] OR Operating Rooms [Mesh] OR Preoperative Care [Mesh] OR Perioperative Care [Mesh] OR Postoperative Care [Mesh] OR Intraoperative Period [Mesh] OR Postoperative Period [Mesh] OR Perioperative Nursing [Mesh] OR Anesthesia and Analgesia[Mesh] OR Anesthetics[Mesh] OR surger\*.ti,ab,kw. OR surgic\*.ti,ab,kw. OR Operating Room .ti,ab,kw. OR preoperative .ti,ab,kw. OR perioperative .ti,ab,kw. OR intraoperative .ti,ab,kw. OR postoperative .ti,ab,kw. OR Anaesthesia .ti,ab,kw. OR Anaesthetics .ti,ab,kw. OR Anesthetics .ti,ab,kw. OR Analgesia .ti,ab,kw. OR postanesthesia .ti,ab,kw. OR Recovery room .ti,ab,kw. OR Recovery rooms .ti,ab,kw. OR PACU .ti,ab,kw.) AND (Safety [Mesh] OR Retreatment [Mesh] OR Mortality [Mesh] OR Fatal Outcome [Mesh] OR Survival Rate [Mesh] OR Intraoperative Complications [Mesh] OR Postoperative Complications [Mesh] OR Health Status Disparities [Mesh] OR Safety Management [Mesh] OR Medical Errors [Mesh] OR Medication Errors[Mesh] OR Retreatment .ti,ab,kw. OR hospital mortality .ti,ab,kw. OR operative mortality .ti,ab,kw. OR peroperative mortality .ti,ab,kw. OR perioperative mortality .ti,ab,kw. OR postoperative mortality .ti,ab,kw. OR Fatal Outcome .ti,ab,kw. OR Survival Rate .ti,ab,kw. OR Surgical Wound Infection .ti,ab,kw. OR Health Status .ti,ab,kw. OR Recovery of Function .ti,ab,kw. OR Patient Safety .ti,ab,kw. OR Safety Management .ti,ab,kw. OR

adverse effect .ti,ab,kw. OR Incident .ti,ab,kw. OR Medical Errors .ti,ab,kw. OR Medication Errors .ti,ab,kw.)

Hits:633

### Embase

(exp patient participation/ OR exp preoperative education/ OR exp consumer health information/ OR exp educational technology/ OR audiovisual equipment/ OR preoperative education .ti,ab,kw. OR Pamphlets .ti,ab,kw. OR Consumer Health Information .ti,ab,kw. OR Educational Technology .ti,ab,kw. OR audiovisual aids .ti,ab,kw. OR ipad .ti,ab,kw. OR Handout\* .ti,ab,kw OR (( Patient .ti,ab,kw. OR patients .ti,ab,kw. OR stakeholder\*.ti,ab,kw. OR consumer .ti,ab,kw. OR user\*.ti,ab,kw. OR lay\*.ti,ab,kw. or client\*.ti,ab,kw. OR citizen\*.ti,ab,kw. OR communit\*.ti,ab,kw. OR public\*.ti,ab,kw. OR caregiver\*.ti,ab,kw. OR parent\*.ti,ab,kw. OR relative\*.ti,ab,kw.) Adj1 (participat\*.ti,ab,kw. OR involv\*.ti,ab,kw.))) AND (hospital department/ OR exp operating room/ OR exp preoperative care/ OR exp perioperative period/ OR exp postoperative care/ OR exp intraoperative period/ OR exp postoperative period/ OR exp perioperative nursing/ OR exp anesthesia/ OR Operating Room .ti,ab,kw. OR Operating Rooms .ti,ab,kw. OR preoperative.ti,ab,kw. OR preoperative .ti,ab,kw. OR perioperative .ti,ab,kw. OR intraoperative .ti,ab,kw. OR postoperative .ti,ab,kw. OR Anaesthesia .ti,ab,kw. OR Anesthesia.ti,ab,kw. OR Anaesthetics .ti,ab,kw. OR Anesthetics .ti,ab,kw. OR Analgesia.ti,ab,kw. OR postanesthesia .ti,ab,kw. OR Recovery room .ti,ab,kw. OR Recovery rooms.ti,ab,kw. OR PACU .ti,ab,kw. ) AND (exp retreatment/ OR exp patient safety/ OR mortality/ OR exp fatality/ OR exp survival rate/ OR exp peroperative complication/ OR exp health disparity/ OR exp convalescence/ OR medication error/ OR surgical error/ OR therapeutic error/ OR “Retreatment” .ti,ab,kw. OR “hospital mortality” .ti,ab,kw. OR “operative mortality” .ti,ab,kw. OR “peroperative mortality” .ti,ab,kw. OR “perioperative mortality” .ti,ab,kw. OR “postoperative mortality” .ti,ab,kw. OR “Fatal Outcome” .ti,ab,kw. OR “Survival Rate” .ti,ab,kw. OR Surgical Wound Infection .ti,ab,kw. OR “Health Status” .ti,ab,kw. OR “Recovery of Function” .ti,ab,kw. OR “Patient Safety” .ti,ab,kw. OR “Safety Management” .ti,ab,kw. OR “adverse effect” .ti,ab,kw. OR “adverse effects” .ti,ab,kw. OR Incident .ti,ab,kw. OR incidents .ti,ab,kw. OR medication error .ti,ab,kw.)

Hits: 492

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**Appendix 2:** Overview of systematic reviews on smoking and alcohol cessation programs.

Author, Year, [reference]	Number of included studies	Number of participants	Included studies	Participants	Intervention	Outcome	Conclusion	Statistical significance
Möller AM. 2009 <sup>[12]</sup>	4	627	RCT's	Smokers scheduled for elective surgery	Any pre-operative smoking cessation intervention at least 48 hours before surgery	Smoking cessation, morbidity and mortality	Smoking cessation intervention is beneficial for reducing the incidence of complications	Not reported
Oppedal K. 2013 <sup>[13]</sup>	2	69	RCT's	Hazardous drinkers scheduled for surgery	All pharmacological and psychosocial preoperative alcohol cessation interventions, given in relation to a surgical procedure, that aimed to stop or reduce alcohol consumption pre-operatively	Primary: Postoperative complications and mortality Secondary: Length of stay and alcohol consumptions	Intensive preoperative alcohol cessation interventions may significantly reduce postoperative complication rates. No effect on mortality rates was found.	Decrease post-operative complication rate: Odds ratio 0.22 95CI 0.08-0.61, p = 0.004
Tønnesen, 2009 <sup>[14]</sup>	9	Unknown	Systematic review, RCT's, clinical controlled trials, descriptive studies, experts and medical textbooks	Smokers and hazardous drinkers scheduled for surgery	6 Smoking and 3 alcohol cessation intervention studies	Postoperative complications	Intervention programs starting 3-8 weeks before surgery will significantly reduce the incidence of -postoperative complications	Not reported
Thomsen 2009 <sup>[15]</sup>	11	1194	RCT's	Smokers scheduled for elective surgery	Interventions could include the five A's (ask, advise, assess, assist, arrange), behavioral counseling or other methods of counseling and/or pharmacotherapy	Postoperative complications	Preoperative smoking cessation interventions significantly reduced the occurrence of postoperative complications after surgery	Decrease post-operative complication rate: RR 0.56 95%CI 0.41-0.78, P < 0.001

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