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Published

2019

Journal Title

Anaesthesia

DOI

10.1111/anae.14826

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Exploring patient attitudes to behaviour change before surgery to reduce peri-operative risk: preferences for short versus long-term behaviour change.*

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**This work was presented in part at the following conferences:*

Does surgery provide a 'teachable moment' for changing multiple health behaviours? UK Society for Behavioural Medicine Annual Scientific Meeting, Liverpool, UK. December 2017.

Changing Multiple Health Behaviours Prior to Major Surgery: Surgery as a Teachable Moment. European Health Psychology Society (EHPS) annual conference, Padova, Italy, August 2017.

Changing health behaviours prior to major surgery. Prehabilitation and Perioperative Care. Royal College of Surgeons, Edinburgh, UK, March 2017.

Changing Health Behaviours prior to Surgery. What are your views? Preoperative Association, London, November 2016.

Short title: Changing Health Behaviours: Surgery as a teachable moment.

Keywords:

Summary

Pre-operative intervention to improve general health and readiness for surgery is known as prehabilitation. Modification of risk factors such as physical inactivity, smoking, hazardous alcohol

consumption and an unhealthy weight can reduce the risk of peri-operative morbidity and improve patient outcomes. Interventions may need to target multiple risk behaviours. The acceptability to patients is unclear. We explored motivation, confidence and priority for changing health behaviours prior to surgery for short-term peri-operative health benefits in comparison with long-term general health benefits. A total of 299 participants at three UK Hospital Trusts completed a structured questionnaire. We analysed participant demographics and risk behaviour profile using independent sample t-tests and odds ratios. Ratings of motivation, confidence and priority were analysed using paired sample t-tests. We identified a substantial prevalence of risk behaviours in this surgical population, and clustering of multiple behaviours in 42.1% of participants. Levels of motivation, confidence and priority for increasing physical activity, weight management and reducing alcohol consumption were higher for peri-operative vs. longer-term benefits. There was no difference for smoking cessation, and participants reported lower confidence compared with other behaviours. Participants were also more confident than motivated in reducing their alcohol consumption pre-operatively. Overall, confidence ratings were lower than motivation levels in both the short and long-term. This study identifies both substantial patient desire to modify behaviours for peri-operative benefit and the need for structured pre-operative support. These results provide objective evidence in support of the pre-operative teachable moment and patient desire to change behaviours for benefit in the short term.

Introduction

An estimated 280 million elective surgical procedures are performed worldwide annually [1]. Major surgery is associated with a risk of adverse outcomes including premature mortality and morbidity [2,3]. Several factors may elevate individual peri-operative risk, including chronic health conditions such as frailty and anaemia [4-6] and risk behaviours [7–11]. There is growing evidence that physical inactivity (promoting poor aerobic fitness and sarcopaenia), high or low BMI, smoking, and hazardous alcohol consumption are linked to poorer postoperative outcomes [7–11]. Intervening to modify known risk behaviours prior to surgery can reduce the likelihood of peri-operative complications, a concept known as 'prehabilitation' [12–14].

Encouraging individuals to adopt and maintain health-promoting behaviours represents a global challenge [15]. Several risk behaviours are implicated in the development of pathologies that require major surgical intervention. Prevalence may be higher in surgical populations [12–14]. However, targeting risk behaviours prior to surgery may provide particular opportunities. The pre-operative period is considered a 'teachable moment' [16]. During this time, patients may be more receptive to altering their risk behaviours, reflecting changes in health cognitions such as their 'risk appraisal' of the upcoming operation. Studies have shown teachable moments, such as receiving a diagnosis of cancer and health screening, can impact positively on the determinants of health-promoting behaviours [16].

The teachable moment in the prehabilitation context may have an additional dimension to facilitate behaviour change; patients might have greater motivation and confidence in their ability to change their risk behaviours since they are encouraged to do so for a restricted period (i.e. pre-operatively), yielding short-term health benefits. Patients could perceive this as more acceptable than the prospect of making permanent behavioural changes to improve long-term general health. Previous research has shown that individuals tend to favour actions that promote proximal health benefits over distal ones [17]. Therefore, patients may be motivated and confident about taking action that brings about proximal peri-operative health benefits, and assign a high priority to making these changes in the weeks leading up to their surgery.

Since risk behaviours tend to occur in clusters, prehabilitation interventions will often need to consider multiple risk factors prior to surgery [18]. Encouraging patients to make changes to multiple behaviours is important, as it is likely to have a greater impact on postoperative health than changing a single behaviour alone [19]. However, knowledge about the determinants and inter-relationships between multiple health behaviours is still in its infancy [20]. Whilst there is evidence of synergistic effects from multimodal intervention, the optimal sequencing and combination of risk behaviours is unclear [21]. Multiple behaviour change interventions temporally restricted to the peri-operative

period, and associated with salient short-term health benefits, may be more acceptable to patients than those targeting multiple behaviours for long-term general health benefits.

The primary aim of the study was to explore patients' motivation, confidence and priority in relation to changing individual and multiple risk behaviours according to two different temporal frames; changing individual and multiple behaviours for a restricted period to achieve proximal (short-term) peri-operative health benefits and changing behaviours to achieve distal (long-term) health benefits. The study aimed to compare intra-individual responses to proximal and distal behaviour change scenarios. The secondary aim was to explore intra-individual differences in motivation and confidence across all behaviours to achieve behaviour change within the short and long-term.

Methods

Ethical approval was granted by The Wales Research Ethics Committee, and subjects provided written informed consent prior to participation. A study investigator at pre-operative assessment clinics at James Cook University Hospital, Middlesbrough, The York Hospital, York and the University Hospital of North Durham, approached potentially eligible participants. Patients aged 18 years and above awaiting any type of surgical intervention were eligible to participate. Patients < 18 years, and those who were unable to provide informed consent, were not eligible to participate. We recruited participants between December 2015 and April 2017.

We designed a structured questionnaire (Appendix online) to assess patients' motivation, confidence and priority assigned to changing risk behaviours (physical activity, weight management, smoking and alcohol consumption). The questionnaire had two main sections: the first section collected data on socio-demographic variables (age; sex; marital status; ethnicity; postcode; and occupation) and assessed baseline pre-operative risk behaviours (physical activity; weight management; smoking; and alcohol consumption). We assessed pre-operative physical activity levels using the seven-item International Physical Activity Questionnaire [22]. We calculated body mass index (BMI) as a surrogate for unhealthy weight. Pre-operative smoking and alcohol consumption were assessed with two questions about status (smoker/non-smoker; drinks alcohol/does not drink alcohol) and frequency (number of cigarettes/alcohol units per week), respectively.

Following a short introduction to contextualise the potential benefits of long- and short-term behaviour change, the questionnaire was constructed to evaluate participants' motivation, confidence and priority across the two temporal frames; first for long-term behaviour change, then repeat questioning for short-term change with reference to the 4-6 weeks before surgery. The final part of the questionnaire focused on motivation, confidence and priority in relation to changing multiple behaviours for long-term vs. short-term benefits, respectively. Questionnaire items assessing patient's

cognitions were scored using a Visual Analogue Scale (VAS) from 0 (e.g. not at all motivated) to 100 (e.g. extremely motivated).

The second section of the questionnaire assessed patients' cognitions in relation to changing individual and multiple behaviours. We assessed participant's motivation and confidence, and the priority they assigned to changing risk behaviours. We formulated the questionnaire items used to assess these health-related cognitions in line with recommendations [23–25]. Each item was formulated in relation to one of five target behaviours: increasing physical activity; achieving or maintaining a healthy weight (BMI between 18.5 and 24.99 $kg.m^{-2}$); not smoking; reducing alcohol consumption; and doing all four (i.e. multiple behaviour change).

The questionnaire was completed in clinic by the participant in the presence of a study investigator, allowing facilitated support if required. The study investigator also recorded the participant's BMI, planned operation, hospital site, and magnitude of operation (e.g. minor to major) coded according to NICE guidelines [26].

We entered participants' home postcodes using the database from the Office for National Statistics website (www.ons.gov.uk) to obtain an Index of Multiple Deprivation Score [27], which was used as an indicator of socio-economic status. Responses to questions about risk behaviours were collapsed into binary variables representing risk status (e.g. non-smoker [0], smoker [1]; healthy BMI [0], unhealthy BMI [1]). We categorised weekly physical activity levels and alcohol consumption into binary variables representing risk status, according to recommended thresholds. We classified status as 'risky' for physical activity at < 150 min per week of aerobic exercise, and alcohol consumption >14 units per week [28, 29]. The four pre-operative health behaviour variables were summed to create a pre-operative risk behaviour score to represent the number of unhealthy behaviours each patient was engaged in at the time of completing the questionnaire.

An unpublished audit by our research team of 450 pre-operative patients demonstrated that one third of patients displayed at least one risk behaviour. At a 90% confidence level with a 5% margin of error, at least 240 randomly sampled patients would be needed. This would be likely to provide at least one risk behaviour in 28–38% of the sample. A sample size of 300 was chosen as an achievable but reliable target. Recruitment was stopped once this target was reached.

We analysed participant characteristics and their relationship with risky behaviours using independent samples t-tests with odds ratios (OR) calculated where appropriate. Paired samples t-tests were conducted to compare intra-individual differences in motivation, confidence and priority regarding changing behaviours in the short-term vs. long-term. We used the same analysis strategy to compare differences in motivation and confidence to achieve change within the two timeframes. SPSS 24 (IBM Corp.) was used to conduct the analysis. We calculated ninety-five percent confidence intervals where appropriate, and considered a value of $p< 0.05$ to be statistically significant.

Results

We approached 485 patients across the three hospital sites and invited them to participate, with 301 providing informed consent. Sixty-seven patients declined to participate without giving a reason, 63 declined due to lack of time, 50 were not recruited due to lack of research staff and four patients declined due to lack of interest. Of the 301 participants recruited, one withdrew and one did not complete a representative number of questionnaire items, and was excluded from subsequent analyses. The remaining 299 participants (65.2% male) had a mean (SD) age of 64.7 (15.6) years, and the majority of the participants were retired (60.9%) and awaiting major surgery (56.2%). Further details of participant characteristics are displayed in Table 1.

More than three-quarters of the sample (87.3%) were engaged in at least one pre-operative risk behaviour, and a substantial proportion (42.1%) of the total sample was engaged in at least two or more (i.e. multiple) pre-operative risk behaviours. Further details about participants' pre-operative behavioural risk status are displayed in Table 2. The mean age was higher in physically inactive participants 69.0 (12.2) vs. 62.5 (16.5) years in active participants (p = 0.001). The retired population were more likely to be physically inactive (OR 1.8, (95%CI 1.1–3.1)). Men were more likely to drink hazardously (OR 2.3, (95%CI 1.2–4.2)) and have an unhealthy BMI (OR 1.5, (95%CI 1.1–2.0)). No association was observed between the Index of Multiple Deprivation score and the prevalence of risk behaviours.

Participant ratings of motivation, confidence and priority for increasing physical activity, achieving/maintaining a healthy weight status, and reducing alcohol consumption were significantly higher in the short-term compared with the long-term (Table 3). There were no significant differences in ratings of motivation, confidence or priority in the short-term vs. the long-term for stopping smoking. All ratings associated with changing risk behaviours in the short-term were scored in the range of 60-80 on the visual analogue scale, with the exception of ratings of confidence to stop smoking, which was scored considerably lower. There was a statistically significant difference in ratings of motivation, confidence and priority for changing multiple behaviours in the short-term compared to the long-term (Table 3).

Table 4 demonstrates statistically significant differences between patients' levels of motivation for changing risk behaviours and their confidence scores for achieving change in both the short- and long-term scenarios. Patients were significantly more motivated than confident in their ability to stop

smoking, increase their physical activity, maintain a healthy weight or make multiple behaviour changes. Conversely, patients reported higher confidence scores than motivation scores for reducing their alcohol intake.

Discussion

In this study, 87% of patients recruited from preassessment clinics reported at least one risk behaviour, with 42% engaged in multiple (≥ 2) unhealthy behaviours at preassessment. The majority of participants reporting ≥ 2 risk factors formed two clusters; (i) low physical activity and an unhealthy BMI, or (ii) an unhealthy BMI and hazardous alcohol consumption. Intra-individual comparisons of behaviour change in the short vs. longer-term demonstrated greater motivation, confidence and higher prioritisation around behaviour change for proximal peri-operative benefits compared with longer-term health benefits. This was seen across all risk factors considered, except for smoking. Patients also reported greater motivation, confidence and higher priority relating to multiple behaviour change in the short vs. longer-term. With the exception of alcohol, patients were significantly less confident than motivated to change their health behaviours. This suggests that whilst patients understand the importance and health benefits of preoperative lifestyle change, they may lack the confidence to make changes without intervention or support.

The prevalence of risk factors was in keeping with previously published rates for the UK population [30–32]. Our findings suggest individuals awaiting surgery may welcome support to increase activity, achieve or maintain a healthy weight and reduce alcohol consumption. They may be less positive about smoking cessation. This finding may relate to wider debate around the 'hardening hypothesis' in modern western smokers; despite falling rates of tobacco use overall, those who continue to smoke, despite concerted and high-profile public health campaigns, may be more difficult to reach [33].

In contrast to other risk behaviours, confidence ratings for reducing alcohol consumption were higher than motivation and priority. Whilst participants felt that reducing alcohol consumption pre-operatively was achievable, this was less desirable and important in comparison with other behaviours. This may suggest a disconnect between medical and participants' perceptions of what level intake is hazardous to health.

Overall, these findings relate to a 'teachable moment' in healthcare [16]. Similar to pregnancy or a recent myocardial infarction, the up-coming operation appeared to be associated with increased motivation to engage in positive lifestyle change. However, in contrast to the classical conceptualisation of a teachable moment, which is grounded in pursuing behaviour change in order to experience longer-term health benefits, our findings suggest a focus on the immediate and short-term

peri-operative benefits may be most successful in engaging patients in health behaviour change during the pre-operative period. It is unclear how this relationship would change postoperatively. Motivation to achieve lasting health benefits may change postoperatively. This has significant population health implications, given the number of patients undergoing surgery annually and the high prevalence of these unhealthy behaviours.

There is a lack of research exploring the acceptability of changing multiple behaviours in the prehabilitation context. Previous research exploring the optimal number of behaviours to address demonstrated a curvilinear relationship between the number targeted and change achieved. Intervention across a moderate number of behaviours may be more successful than a single behaviour or larger number [34]. In addition, the value and acceptability of multimodal interventions targeting behaviours simultaneously vs. sequentially are debated. In a sequential approach, the optimal order is also unclear [35,36]. This is important to establish given behaviours may need to be prioritised in limited preoperative timeframes.

The study population was drawn from sites in the north of England, which may limit wider applicability. In addition, this study describes self-reported behavioural data, and is therefore open to self-report bias. Objective recordings (e.g. activity tracking devices or carbon monoxide monitors) would have provided a more accurate representation of patients' peri-operative risk behaviours. Preferences for short-term vs. long-term behaviour change may be moderated by inter-individual factors, such as the number of risky behaviours to change and the magnitude of the change required. These inter-individual factors were not explored in the analysis because it focused on intra-individual differences in views towards changing behaviour according to different temporal time frames, assessed at the same point in time. In addition, the number of responses varied across risk factors, depending on participant engagement in specific unhealthy behaviours. This is particularly relevant for smoking and a low BMI which formed smaller subgroups. Results for these behaviours may limit generalisability.

A recent analysis of surgical outcome data from 44,814 patients across 27 low-, middle- and high-income countries found that post-surgical morbidity (≥ 1 complication) and mortality rates were 16.8% and 0.5%, respectively [3,37]. This is consistent with data from the UK, with the proportion of patients suffering at least one serious complication at 5–21% (depending on operation type) – the impact of complications is to increase hospital length of stay by two to four-fold [36]. Optimising patients' health behaviours as part of the prehabilitation process may help to reduce the risk of adverse postoperative events and associated health and social care costs in the short and longer term [38,39]. We have highlighted that patients may be receptive to pre-operative behaviour change with significant levels of

motivation to improve their peri-operative outcomes, reinforcing the idea of a pre-operative 'teachable moment'. Confidence across all behaviours (except alcohol consumption) was rated lower than motivation. This knowledge is of upmost importance when it comes to planning and introducing prehabilitation services. If the teachable moment is to be used to its greatest extent, patients must be provided with dedicated support to build confidence. Confidence to stop smoking was particularly low, underlining the need for intensive support services to encourage pre-operative cessation. Given that some of the highest scores for motivation were seen in the 'multiple behaviour change' domain, there may be an underutilised opportunity to improve both peri-operative outcomes and longer-term patient population health. In the prehabilitation context, this is only relevant to those who are engaging in multiple risky behaviours. It is likely that interventions would need to target behaviours simultaneously, since pre-operative timeframes for health behaviour change are often limited. The 'optimal' strategy for multimodal intervention remains unclear and a joint, pragmatic approach between the patient and peri-operative team considering patient motivation, priorities, available time and support may be appropriate.

In conclusion, patients show favourable attitudes towards changing single and multiple health behaviours prior to surgery. Surgery appears to be a 'teachable moment' for encouraging health behaviour change prior to surgery. The findings can inform pre-operative interventions targeting behaviour change and guide pre-operative clinical practice.

Acknowledgements

This study was funded by a grant from the Preoperative Association (awarded September 2015). The authors declare no conflicts of interest.

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Table 1 Characteristics of 299 participants recruited from preassessment clinics. Values are number

Hospital	James Cook University Hospital	132 (44.1%)
	York Hospital	148 (49.5%)
	University Hospital North Durham	19 (6.4%)
Age		64.7 (15.6)
Sex	Male	195 (65.2%)
Martial Status	Married/partnered	178 (59.5%)
	Single/divorced/widowed	118 (39.5%)
	Missing data	3 (1%)
Occupation	Employed	97 (32.4%)
	Retired	182 (60.9%)
	Unemployed	19 (6.4%)
	Missing data	1 (0.9%)
IMD score*	1–5	99 (33.1%)
	6–10	169 (56.5%)
	Missing data	31 (10.4%)
Surgical category	Major	168 (56.2%)
	Moderate	88 (29.4%)
	Minor	37 (12.4%)
	Missing Data	6 (2.0%)
Surgery Type	Gastro-intestinal (upper and lower)	118 (39.5%)
	Urology	57 (19.1%)
	Vascular	50 (16.7%)
	Orthopaedics	35 (11.7%)
	Ear, Nose and Throat	18 (6.0%)

(proportion) or mean (SD).

Ophthalmology	7 (2.3%)
Plastics	5 (1.7%)
Breast	3 (1.0%)
Missing Data	6 (2.0%)

*IMD; Index of Multiple Deprivation score. 1 represents the most socio-economically deprived 10% of postcodes and 10 represents the least deprived 10% of postcodes in England.

Table 2 Participant pre-operative risk behaviours. Values are number (proportion).

Physical activity level* (n = 281)**	Low	88 (31.3%)
	Moderate	95 (33.8%)
	High	98 (34.9%)
BMI (kg.m^{-2}) (n = 299)	< 18.5	2 (0.7%)
	18.5–24.99	78 (26.1%)
	25–29.99	124 (41.5%)
	> 30	95 (31.8%)
Smoking status (n = 299)	Smoker	39 (13.0%)
	Non-smoker	260 (87.0%)
Hazardous alcohol consumption* (n = 299)**	Hazardous consumption	53 (17.7%)
	Consumption below hazardous threshold	242 (81.0%)
	Missing data	4 (1.3%)
Number of risk behaviours (n = 299)	0	38 (12.7%)
	1	135 (45.2%)
	2	103 (34.4%)
	3	21 (7.0%)
	4	2 (0.7%)
Clustering of risk behaviours	Unhealthy weight and physical inactivity	53 (17.7%)
	Unhealthy weight and hazardous alcohol	28 (9.4%)
	Unhealthy weight and smoking	12 (4.0%)
	Physical inactivity and smoking	6 (2.0%)
	Hazardous alcohol and smoking	3 (1.0%)
	Physical inactivity and hazardous alcohol	1 (0.3%)

*Physical activity level; 'moderate' and 'high' met the World Health Organization weekly physical activity recommendations [27].

**Number of responses < 299 due to missing data when participants did not complete all questions

***Hazardous alcohol consumption; defined as greater than 14 units per week for both men and women [28].

Table 3 Cognitions about engaging in health behaviour change for short-term vs. long-term benefits for individual and multiple risk behaviours. Values are mean (SD).

		VAS* rating for short-term peri-operative benefits	VAS* rating for long-term health benefits	95%CI	p value
Increasing physical activity	Motivation (n = 299)	73.4 (25.0)	63.6 (26.0)	-12.8 to -7.0	< 0.001
	Confidence (n = 299)	67.8 (27.6)	59.7 (28.2)	-11.1 to -5.3	< 0.001
	Priority (n = 299)	73.7 (24.9)	64.8 (27.2)	-11.8 to -5.9	< 0.001
Achieving/maintaining healthy weight**	Motivation (n = 298)	77.6 (20.2)	75.2 (20.9)	-4.6 to -0.1	0.040
	Confidence (n = 297)	73.5 (23.4)	70.5 24.3)	-5.4 to -0.6	0.013
	Priority (n = 298)	78.1 (19.4)	75.4 (21.3)	-4.6 to -0.8	0.006

Stopping smoking* **	Motivation (n = 39)	65.3 (32.2)	55.6 (33.0)	-20.7 to 1.4	0.085
	Confidence (n = 39)	48.2 (35.0)	42.7 (31.5)	-12.3 to 1.5	0.119
	Priority (n = 39)	66.0 (32.3)	60.5 (31.7)	-14.7 to 3.7	0.231
Reducing alcohol consumption* **	Motivation (n = 183)	72.9 (30.0)	47.2 (32.1)	-30.2 to -21.3	< 0.001
	Confidence (n = 183)	79.8 (24.7)	63.0 (32.0)	-20.8 to -12.9	< 0.001
	Priority (n = 183)	73.7 (29.1)	48.8 (32.8)	-29.7 to -20.1	<0.001
Changing multiple behaviours	Motivation (n = 299)	77.1 (23.2)	68.5 (27.5)	-11.1 to -6.2	<0.001
	Confidence (n = 299)	64.9 (28.8)	56.4 (29.9)	-11.0 to -5.9	<0.001
	Priority (n = 299)	73.1 (24.8)	66.4 (27.7)	-9.1 to -4.4	<0.001

***** VAS; Visual Analogue Scale.

** Number of responses < 299 due to missing data when participant did not complete all questions.

*** Number of responses < 299 as not all participants smoked or consumed alcohol.

Table 4 Differences in Motivation vs. Confidence ratings for behaviour change in the short and longer-terms. Values are mean (SD).

	Short-term peri-operative benefits	**95% CI**	**p value**	**long-term health benefits**	**95% CI**	**p value**
Increasing physical activity (n = 299)	+5.6 (21.6)	3.2–8.1	< 0.001	+3.9 (25.8)	0.9–6.8	0.01
Achieving/maintaining healthy weight* (n = 297)	+4.1 (17.4)	2.1–6.1	< 0.001	+4.7 (22.9)	2.1–7.3	< 0.001
Stopping smoking (n = 39)**	+16.7 (25.4)	8.6–24.8	< 0.001	+12.6 (34.6)	1.6–23.7	0.026
Reducing alcohol consumption (n = 183)**	-6.9 (24.7)	-10.5 to -3.3	< 0.001	-15.8 (33.0)	-20.6 to -11.0	< 0.001
Changing multiple behaviours	+12.3 (22.0)	9.8 - 14.8	< 0.001	+12.0 (25.3)	9.2–15.0	< 0.001

(n = 299)	

* Number of responses < 299 due to missing data when participant did not complete all questions.

** Number of responses < 299 as not all participants smoked or consumed alcohol

Online supplement

Appendix 1 Copy of patient health behaviour questionnaire

Figure 1 Participant flow diagram