A Systematic Review of the Effects of Surgery on Health Behavior in First Degree Relatives: An Opportunity for Intervention

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ABSTRACT

Background: Surgery is a major life event that can serve as a driver of lifestyle modification. In many cases, first degree relatives are affected by seeing a family member undergo surgery. This review was conducted to assess how consistently surgery promotes change in behavioral health status in first degree relatives of surgical patients.

Data Sources: A comprehensive search of the MEDLINE database identified 6 articles that quantitatively discuss the effect of surgery on change in behavioral health status in first degree relatives of surgical patients. Studies discuss changes after weight loss surgery, breast cancer surgery and pediatric surgery.

Conclusions: Results show that surgery leads to lifestyle modification in patients’ first degree relatives. Change can be either positive or negative, and high risk individuals are more likely to modify behavior. The study highlights a potential opportunity for behavioral intervention to promote positive modification of health behavioral status in relatives of surgical patients.

INTRODUCTION

Surgery is a major event in many patients’ lives. Studies have shown that a surgical experience can serve as a wake-up call for patients, catalyzing behavioral change in people who have had long lasting trouble with health maintenance.1 The perioperative period is thus an opportunity for intervention in which patients can be nudged in the right direction through the various stages of behavioral change. In many cases, the surgical experience is as taxing for relatives as it is for patients themselves. It follows then that surgery should be a possible point of change, not only for patients but also for their relatives. The rationale is simple when tied to the Social Cognitive Theory (SCT) of behavioral science.2 Relatives see the long-term consequences of bad health habits and realize the severity of the outcome. Following this theory, they should come to terms with the reality of their personal risk and thus be more open to behavioral change interventions.

The literature on the topic of change in behavioral health status in first degree relatives of surgical patients is very slim. There are few
studies that quantitatively discuss perioperative change in behavioral health status in relatives of surgical patients. No reviews have been conducted, and no interventions have been put in place to make use of what is clearly a huge opportunity for public health intervention.

The purpose of this review was to ascertain from the literature how often surgery serves as a catalyst for change in behavioral health status of patients’ relatives. It was hypothesized that the review would confirm the high occurrence of lifestyle modification following surgery in a relative. Additionally, the review was expected to provide some information about the direction of behavioral health status change (positive or negative) when it does occur.

METHODS

Search Strategy

Institutional Review Board approval was not required for this review. An outline of relevant research on the topic was developed by conducting a thorough systematic search using the MEDLINE database. The search was predominantly manual, including search terms determined to be appropriate by the author. The most recent search for articles to be included in this review was conducted in July 2012. Results were limited to peer-reviewed articles published in the last 10 years.

The search strategy (outlined in greater detail in Fig. 1) involved a four-step process. In the first step, appropriate search terms were selected in three categories: population, outcome, and modifier. The “advanced search” tool in MEDLINE was employed, with each search comprised of one search term from each category (Fig. 1). This strategy generated a total of 98 combinations, each one representing a MEDLINE search. The second step involved another MEDLINE search for articles with the term “Halo Effect.” This was an attempt to generate studies related to the interesting term “Halo Effect” as applied by Woodard et al. to describe beneficial effects of bariatric surgery in the spouses of surgical patients.3 Step 3 involved analyses of the citations from articles that had been identified in the first two steps. Potential articles were considered for inclusion in the

![Figure 1. Outline of search strategy.](image-url)
study based on the criteria described below. Step 4 involved a search on Google Scholar for relevant articles that had cited the manuscripts identified in steps 1 through 3.

Eligibility of Citations (Inclusion and Exclusion Criteria)

Studies were included in the review if they quantitatively assessed change in behavioral health status in first degree relatives of surgical patients. As described in the search criteria (see Fig. 1), “change in behavioral health status” was broadly defined to encompass weight change, smoking cessation, exercise, diet change and modification of alcohol or drug use. Studies must have been published in the last 10 years (2002 – 2012). There were no limitations based on the type of surgical procedure. In situations where articles discussed relatives of surgical and non-surgical patients, studies were included if greater than 50% of participants were relatives of surgical patients. Search results suggest that the volume of data could have been significantly increased by expanding the inclusion criteria to permit studies including relatives of non-surgical patients. However, the primary goal here is to assess behavioral change as a function of surgery in first degree relatives. Expanding the criteria would automatically change the focus of the review.

Special consideration was given to articles that dealt predominantly with increased caregiver stress, a phenomenon that does not fall under this study’s definition of change in behavioral health status. Articles that focused on caregiver stress were acceptable for inclusion if they also included some consideration of more traditional features of behavioral health status as described above.

Efficacy Criteria for Best Evidence

Methodological quality of the included studies was evaluated by applying a 7-item quality checklist, derived by adopting the relevant parts of the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) assessment as outlined by Karg et al.4 The quality criteria include (1) clear statement of objectives and hypothesis, (2) clear eligibility criteria for participants, (3) clear definition of variables,(4) replicability of statistical methods, (5) assessment of ethnicity, (6) sufficient descriptive data (age, sex, and ethnicity) and (7) consideration of population stratification (Table 3).

The initial goal was to further select for studies based on quality of research presented. However, given the limited number of articles that satisfied eligibility criteria, the author decided not to select studies based on quality scores.

RESULTS

Articles Selected for Review

Despite the large yield of the initial search, the literature on behavior change in first degree relatives of surgical patients was quite limited. From the initial yield of over 6000 articles, the title review yielded 42 articles that had the potential to meet study criteria. After review of abstracts, 9 studies were judged to satisfy eligibility criteria for inclusion in the review. Of these, 6 were maintained after full article review and have been used in review. The population characteristics, procedure information and outcomes of interest are described in Tables 1 and 2.
**Population Characteristics**

First degree relatives surveyed include spouses (n = 4 studies), parents (n = 2 studies), children (n = 2 studies), siblings (n = 1 study) and “first degree relatives” (n = 1 study). Mean age of study participants ranged from 37 to 53 years. Percentage of female participants also showed some variation, ranging anywhere from 0% (spouses of breast cancer patients) to 81%. Only one article reported study sample consisting of greater than 50% ethnic minority participants (range for ethnic minorities, 3.2% to 53.9%).

**Study Characteristics**

Of the six studies ultimately included in the review, three discussed behavior change in first degree relatives after bariatric (weight-loss) surgery, two after surgery for breast cancer, and one after pediatric surgery. The majority of studies were prospective cohort studies (n = 4). Of the other two, one was a cross-sectional survey, and the other was a retrospective cohort study. Study data was generated through in-person interviews in two cases and phone interviews in two cases. The cross-sectional survey was conducted using an on-site questionnaire, and the retrospective cohort study was performed through chart review.

Weight change and physical activity levels were the most commonly assessed factors of behavioral health status (n = 4 studies). Other behavioral changes assessed included smoking cessation (n = 1 study), alcohol use (n = 1 study) and strengthening inter-spouse relationships (n = 1 study).

**Study Results**

All the studies conclude that surgery is associated with some change in behavioral health status in first degree relatives (Table 2). The direction of behavior change, however, was inconsistent across the group. Two of the three studies on behavior change after bariatric procedures reported increased weight loss in first degree relatives. \(^3,5\) Weight loss in the first study was associated with increased activity levels in family members. The second study dealt with the interesting situation of bariatric surgery in patients with relatives who had previously undergone bariatric surgery. This study found that, compared to a control group, gastric by-pass patients achieved greater weight loss if they had a family member who had already undergone a bariatric procedure. The authors of the third article on bariatric surgery observed an increased likelihood of weight gain.

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### Table 1: Study and Population Characteristics

<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Procedure</th>
<th>Study Type</th>
<th>Survey Method</th>
<th>Participants</th>
<th>Number</th>
<th>Age (Mean)</th>
<th>% Female</th>
<th>African American</th>
<th>Hispanic</th>
<th>White</th>
<th>Other</th>
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<td>Woodard (2011)</td>
<td>Bariatric Surgery</td>
<td>Prospective Cohort</td>
<td>In Person</td>
<td>Children, “Adult Family Members”</td>
<td>50</td>
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<td>-</td>
<td>46.1</td>
<td>53.9</td>
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<td>Slotman (2011)</td>
<td>Bariatric Surgery</td>
<td>Retrospective Cohort</td>
<td>Chart Review</td>
<td>Spouses, Parents, Siblings</td>
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<td>40</td>
<td>81</td>
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<td>Cross-sectional Survey</td>
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<td>Madan (2005)</td>
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<td>Prospective Cohort</td>
<td>In person</td>
<td>Spouses</td>
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Table 2: Study Results

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<th>Number</th>
<th>Age (Mean)</th>
<th>%Female</th>
<th>Race</th>
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<td>Prospective Cohort</td>
<td>In Person</td>
<td>Children, &quot;Adult Family Members&quot;</td>
<td>50</td>
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in spouses of bariatric surgery patients. In this third study, 34% of spouses gained weight compared with only 20% who lost weight.

Results were more consistent in the two studies that discussed behavior change in relatives of patients who had received surgical treatment for breast cancer.7,8 In both cases, surgery was associated with positive behavior change in first degree relatives. The first study reported improved diet, increased activity levels and decreased alcohol use in patients and their relatives. However, as described by the study authors, a limited sample size precluded analysis of first degree relatives alone. This study also reported that behavior change was more pronounced when patients and family members believed that these unhealthy behaviors contributed to cancer occurrence.

The second breast surgery study reports improvement in intimacy and marriage satisfaction among spouses of women who had undergone surgery for breast cancer. Results were compiled based on participant responses (Yes/No) to the study questionnaire about improvements in their relationships since surgery. For 42% of couples in the study, had both partners reported an increase in the strength of the relationship after breast cancer surgery. Only 1% of couples in the study reported increased feelings of separation for both partners after surgery.

The final study deals with the unique situation of smoking cessation in parents of pediatric surgical patients. Results highlight a significant increase in quit attempts (OR = 2.61) in parents whose children had undergone surgery in the 12 months preceding the survey. Interestingly, this study did not find an increase in the proportion of successful quit attempts.

Subgroup Analysis

Prior to data analysis, the author of this review anticipated a subgroup analysis of high risk groups to assess any particular inclination toward behavior change in these populations. Only two studies provided significant subgroup analysis for consideration – both in the high risk group of obese relatives of bariatric surgery patients. Slotman et al. found that weight loss after bariatric surgery was more likely in obese first degree relatives compared to overweight or normal weight first degree relatives. Sixty percent of adult study participants were obese. Madan et al. found that weight change was more likely in obese first degree relatives compared with overweight or normal weight relatives.
However, the direction of change was opposite to that established in the first paper. In this case, 75% of obese spouses gained weight compared to only 38% of non-obese spouses.

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**DISCUSSION**

This is the first review of the literature on the relationship between surgery and lifestyle modification in patients’ relatives. The review identified six articles that quantitatively discuss changes in behavioral health status in first degree relatives of surgical patients. While the direction of change varies across papers, 100% of the reviewed articles report some change in behavioral health status. These results identify first degree relatives of surgical patients as having a high likelihood of undergoing changes in behavioral health status. Additionally, subgroup analysis highlights that high risk relatives (e.g. obese individuals) are especially likely to undergo changes in behavioral health status after surgery in a family member.

The author proposes a few possible explanations for this association between surgery and change in behavioral health status in first degree relatives. Most intuitive is the fact that relatives talk to each other. Advice from family members who have undergone surgery could be motivation enough to make a lifestyle change, especially when similar behaviors might have contributed to making the family member a surgical candidate in the first place. Another possible explanation is the imposition of lifestyle modifications on first degree relatives. This is especially relevant for relatives who live with surgical patients. A simple example is the case of bariatric surgery, in which patients might share their dietary restrictions with family members. Yet another possibility is that health care providers – potentially members of the surgical team – encouraged changes in behavioral health status. There are multiple opportunities for interaction between providers and first degree relatives of surgical patients. It is not entirely unreasonable to imagine some exchange of health maintenance information during one of these interactions.

Obviously, each individual motivated to modify behavior will have unique reasons for making changes. One factor that likely plays a role is the emotional strain of seeing a relative go through surgery. The rationale for the interactions between emotions and behavior change is based on principles of Behavioral Science Theory.\(^2\) One such theory, Social Cognitive Theory, postulates that human behavior is in constant interaction with personal factors and environmental influences.\(^2\) In other words, behavior is a function of both personal experience and observation of others’ actions – and very importantly, the consequences of these actions. If follows then that first degree relatives may be driven to make changes in behavioral health status, after seeing the consequences of behavioral imperfections in their family members.

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**Implications for Intervention and Public Health**

Recognizing that first degree relatives of surgical patients are likely to make changes in their health behaviors, hospitals and surgical teams can create appropriate programs to guide patients’ relatives toward healthy lifestyle modification. As highlighted in the results of this review, surgery in a first degree relative can lead to either positive or negative changes in health behavior status. This bi-directionality represents an undervalued opportunity for behavioral intervention in relatives of surgical patients.
Proposing that hospitals and surgical teams contribute to health maintenance of patient’s relatives raises a host of issues, not the least of which is the question of responsibility. (Whose job will it be to spend time educating family members about lifestyle modification?) Other concerns include long term sustainability of interventions and ethical considerations related to interfering with relatives’ roles as support systems for patients undergoing surgery. The author recognizes these concerns but also believes that the potential public health impact of reaching out to relatives outweighs any concerns that might be raised. Creative solutions must be found for these concerns to develop seamless connections between individual patient care and the fields of preventive medicine and public health.

Limitations

This review is limited by the small number of studies that met criteria for inclusion. The search process used to generate studies was quite robust. This limitation is a reflection of the sparse literature on the topic, ultimately highlighting the need for further research. Another limitation of the review is the short duration of follow-up in the majority of studies. This raises some questions about the duration and sustainability of changes in behavioral health status.

Although data on study quality is available (Table 3), this information was not used when deciding what studies to include in the review. This is again a result of the limited number of studies on the topic.

CONCLUSIONS

This comprehensive review of the literature found six articles that quantitatively discuss changes in behavioral health status following surgery in a first degree relative. Results show that surgery is directly associated with lifestyle modification in first degree relatives. However, the direction of change – positive vs. negative – is inconsistent across studies. Additionally, change in behavioral health status is more common in “high risk relatives.” These results highlight a potential opportunity for intervention to promote positive modification of health behavioral status. Research is still needed to assess the relevance of results to other surgical sub-specialties. Additionally, future work should focus on evaluating intervention programs aimed at promoting positive lifestyle changes in first degree relatives of surgical patients.

REFERENCES