Article details	
Title	Wait Times in a Bariatric Surgery Program: A Retrospective Review and Analysis of Operational Factors
Authors	Quereshy, Fayez; Diamant, Adam; Milner, Joseph; Cleghorn, Michelle; Sockalingam, Sanjeev; Okrainec, Allan; Jackson, Timothy
Abstract	Abstract: Background: Increasing rates of obesity has led to growing demand for bariatric surgery. This has implications for wait times, particularly in publicly-funded programs. This study examines the impact of patient and operational factors on wait times in a multidisciplinary bariatric surgery program. Methods: A retrospective study of 1682 patients referred to a large tertiary care centre for bariatric surgery between June 2008 and July 2011 was conducted. Patient characteristics, dates of clinical assessments, and records describing operational changes were collected. Univariable analysis and multivariable log-linear and parametric time-to-event regressions were performed to determine whether patient and operational covariates are associated with the wait time for bariatric surgery (i.e. length of preoperative evaluation). Results: Patients with active substance use (β=0.3482, p=0.024), and individuals who entered the program in more recent operational periods (β=0.2028, p<0.001), were shown to have longer wait times in both a univariable and multivariable analysis. Additionally, the median time-to-surgery has increased over three discrete operational periods (characterized by specific programmatic changes relating to scheduling and staffing levels, as well as varying referral rates and defined surgical targets); p<0.001. Interpretation: This study demonstrates that certain patients that can be identified at referral are at risk for longer wait times. We also find that previous operational decisions have significantly increased the wait time in the program since its inception. Careful consideration must be devoted to process-level decision-making for multi-stage bariatric surgical programs, as managerial and procedural changes can affect timely access to treatment.
Version 1	
Reviewer 1	
Name	Feinberg, Adina
Position	—
Institution	—
Competing interests	—
Date review returned	23-Feb-2015
General comments	page 6/21 line 47: why does it follow that the model with four centres of excellence leads to longer wait times? page 8/21 line 48: were these pateints declined/dropped out or either? page 12/21 line 13: what are the current exclusion criteria regarding

	substance use and what are you suggesting should be changed/made more stringent? Very interesting article, this type of analysis could be applied to many different systems in medicine. Useful for a wide range of practitioners.
Author response	1. Page 6/21 line 47: why does it follow that the model with four centres of excellence leads to longer wait times? Our bariatric surgery program is not regionalized with other programs in the province. All physician referrals for bariatric surgery in Ontario are administered through the Ontario Bariatric Network. Online referral forms are submitted, and all referrals get distributed among these surgical centres. It is the specific model of care (comprehensive, multi-stage assessment as promoted by the American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic & Bariatric Surgery) that appears to lead to prolonged wait times. **We have clarified the description of the study setting in the Methods (paragraph 1, page 6). 2. Page 8/21 line 48: were these patients declined/dropped out or either? Patients who did not reach surgery either dropped out of the program (self-removal), or were declined surgery due to significant clinical and/or psychosocial issues (program removal at the advice of their interdisciplinary team). Our team is currently engaged in qualitative research exploring factors and perceptions affecting patient self-removal/drop out. **We have added this sentence to the Results (paragraph 1, page 9). 3. Page 12/21 line 13: what are the current exclusion criteria regarding substance use and what are you suggesting should be changed/made more stringent? Current drug or alcohol dependency (within 6 months of referral). Although, while smoking is not an exclusion criterion for referral, a patient is not eligible for treatment until they are abstinent for at least 6 months. They must also demonstrate abstinence for at least 3 months before they can proceed to the next assessment in the program. Additionally, patients must stop using any non-prescription or illicit drugs, and drinking alcohol, beer, and wine (as described on the Ontario Bariatric Network's website, which we have now cited). Currently, active users are still referred for surgery, as shown by our results. This is likely because referring physicians are not fully aware of these issues. Therefore, these patients should be identified early, and policy should be enforced to restrict program entry unless they can

	demonstrate prolonged abstinence or until they are re-referred (i.e. after 6 months). **This has been clarified in the Interpretation (paragraph 2, page 12).
Reviewer 2	
Name	de Gara, Chris
Position	—
Institution	University of Alberta, Department of Surgery, Edmonton, Alberta (completed in conjunction with senior resident, Dr Pang Young)
Competing interests	—
Date review returned	19-Mar-2015
General comments	We applaud the authors on a well-organized and clearly described retrospective study on the factors affecting wait times in their institutional bariatric surgery program. There are several general comments: 1. As the focus has been on reduction of wait times while in a bariatric surgery program through multidisciplinary assessments and treatments, when is waiting in a bariatric program appropriate? 2. Increased time in a multidisciplinary bariatric surgery program is associated with increased success of bariatric surgery, especially in screening patients with predictors of success (Gerbrand, Obesity Surgery 2005). Minimization of wait time to the extreme can result in surgery on a poorly prepared patient, which is a recipe for failure. 3. In many bariatric surgery programs, unmanaged substance abuse is an absolute contraindication to referral, given the association with adverse outcomes. It is not procedurally onerous to exclude these patients in the referral process. 4. Inferring on the numbers presented, 724 of 1682 (43.5%) underwent surgery. If based on the number that attended orientation, this proportion is even higher (724/1385 = 52.2%). Presumably, additional patients on this referred set were operated on following the study period. Is this an accurate estimate of the proportion of referred patients operated on? 5. In contrast to other more selective bariatric programs, which may only operate on 30% of all referred patients, is your population comparable? What should be the correct proportion of referred patients that are operated on? Specific Comments: 1. Results a. Multivariate analysis, paragraph 2. The wait times between assessment stations is presented. How much time was spent with each individual assessment

	station, i.e. for multiple visits with dieticians or nurses, what was the interval between appointments? Or were the majority of patients seen with only a single visit by each discipline? 2. Interpretation a. As only 42 of the referred patients had active substance abuse (2.5%), would "more stringent practices" of these patients as an operational change be expected to significantly change systemic wait times? b. Paragraph 4. The statement of increasing post-operative follow-up volume as a bottleneck in reducing in-flow from referral is highly relevant. Are there any numbers to describe the number of active post-op follow-ups during each operative period, and does this correlate directly to the increasing wait times?
Author response	We applaud the authors on a well-organized and clearly described retrospective study on the factors affecting wait times in their institutional bariatric surgery program. There are several general comments: 1. As the focus has been on reduction of wait times while in a bariatric surgery program through multidisciplinary assessments and treatments, when is waiting in a bariatric program appropriate? We believe that an extended preoperative course may be necessary for bariatric patients to facilitate education and improve their understanding of the commitment involved in having bariatric surgery. As well, longitudinal multidisciplinary assessment enables 'medical optimization.' However, we also believe that unnecessarily long wait times may result in patient distress and contribute to increased attrition, which would reduce patient access to surgery. 2. Increased time in a multidisciplinary bariatric surgery program is associated with increased success of bariatric surgery, especially in screening patients with predictors of success (Gerbrand, Obesity Surgery 2005). Minimization of wait time to the extreme can result in surgery on a poorly prepared patient, which is a recipe for failure. We agree with this comment. Our goal is to minimize excess waiting time by streamlining activities, while preserving the integrity of a multidisciplinary program. Moreover, the Ministry target of 365 days from referral to surgery is simply a metric for evaluating efficiency. Future work is needed to examine the clinical utility of shorter or longer wait times in this context. 3. In many bariatric surgery programs, unmanaged substance abuse is

	an absolute contraindication to referral, given the association with adverse outcomes. It is not procedurally onerous to exclude these patients in the referral process. We agree with this comment. The Ontario Bariatric Network, which coordinates the referral process for bariatric programs in the province and develops standardized criteria for consistent care across sites, states that unmanaged substance abuse (current drug or alcohol dependency) is an absolute exclusion criterion for referral. However, given the results presented in our study, we can see that active substance users are still referred and our program has not been successful at identifying these patients and refusing their entry into the program. Therefore we are suggesting that programs should be more stringent, and should adopt methods to improve identification of these patients. For instance, we are currently implementing a patient intake questionnaire to upfront collection of relevant medical and psychosocial information, including substance use, before patients attend orientation or are scheduled for any appointments. 4. Inferring on the numbers presented, 724 of 1682 (43.5%) underwent surgery. If based on the number that attended orientation, this proportion is even higher (724/1385 = 52.2%). Presumably, additional patients on this referred set were operated on following the study period. Is this an accurate estimate of the proportion of referred patients operated on? 724 out of the 1664 (43.5%) who were referred and included in the analysis, and 724 out of the 1385 (52.3%) who attended an orientation, underwent surgery. However, all 1664 patients in the study either underwent bariatric surgery or withdrew from the program by August 2013. That is, patients included in the study were not active (preoperatively) in the program at the time of data collection, and as a result, there were no patients in the study population who had surgery during or after the analysis was performed. **This has been made clearer in the Study Design, Setting and Participants subsection (Methods, paragraph 1, page 6). 5. In contrast to other more selective bariatric programs, which may only operate on 30% of all referred patients, is your population comparable? What should be the correct proportion of referred patients that are operated on? Our paper does not attempt to answer whether the proportion of patients who currently have surgery in our program is optimal or correct. This is difficult to determine. However, the study demonstrates that patients who either eventually decide not to undergo surgery or are poor surgical candidates are attending several assessments (before dropping out or being removed from the

	program). As a result, they are occupying valuable appointments slots, which would be better allocated to good surgical candidates who would be more likely to derive benefit and who would be at lower risk of adverse outcomes. Since program expansion and increased staffing are not possible due to limited funding, a decrease in wait times can only be achieved by alleviating resources through decreasing the number of patients engaged in the system. This might be achieved through identifying patients at risk for attrition or not reaching surgery and directing them to priority assessments first (enhanced triaging practices). Specific Comments: Results 1. Multivariate analysis, paragraph 2. The wait times between assessment stations is presented. How much time was spent with each individual assessment station, i.e. for multiple visits with dieticians or nurses, what was the interval between appointments? Or were the majority of patients seen with only a single visit by each discipline? A very small minority of patients visited an assessment station more than once. The vast majority of patients were seen by each discipline in a single visit prior to surgery. Appointments were between 1-2 hours depending on the assessment, while the inter-station wait times were measured in days or weeks. Interpretation 2. As only 42 of the referred patients had active substance abuse (2.5%), would “more stringent practices” of these patients as an operational change be expected to significantly change systemic wait times? The extent of the information currently collected on the referral document does not allow practitioners to identify patients at risk of non-completion, and these patients (including patients who engage in substance use) can spend a long time in the system, and therefore occupy substantial resources – and many of these patients will end up dropping out or being removed from the program due to ineligibility (late patient attrition). This study has motivated us to consider how routing policies based on information learned at the referral stage may be used to decrease average system times. In the proposed program, providers would identify high-risk patients (including individuals with substance use issues) based on their responses to a questionnaire developed to augment the referral form. 3. Paragraph 4. The statement of increasing post-operative follow-up volume as bottleneck in reducing in-flow from referral is highly relevant. Are there any numbers to describe the number of active

	post-op follow-ups during each operative period, and does this correlate directly to the increasing wait times? Data on active post-operative follow-ups was not available, although the incidence of follow-up appointments (beginning in Period 2) was associated with increased waiting times. Program managers had an opportunity to respond to the increase in follow-up patients by making operational modifications at the beginning of the second and third operational periods. Our results indicate that they were either not able to appropriately account for follow-up patients or underestimated their effect on the wait times for preoperative patients.
Reviewer 3	
Name	Birch, Dan
Position	—
Institution	Royal Alexandra Hospital, Surgery, Edmonton, Alberta
Competing interests	—
Date review returned	09-Mar-2015
General comments	This is an excellent study, analysing the challenging and emerging issue of program structure and its impact on the surgical treatment of severe obesity. Although I believe this manuscript should be published in CMAJ, I would like the authors to consider several areas for improvement and I would ask them to address as many of these items as they can. Ultimately, I think with further enhancements, this manuscript will have a meaningful impact on bariatric care in Canada. The authors should describe the Ontario Bariatric program in enough detail to help inform the reader on how their system works. Terms such as 'stations', 'transitions', 'assessments' etc should be clarified or unifying terms used to facilitate understanding. Perhaps a diagram of patient flow with explanations for how patients move through the process. Is each station a single encounter or are there goals that must be reached before moving on? How were these 'triggers' defined to move patients through the program? Leadership/decision making structure of the program? Please define substance use if not already done so in the manuscript. The authors should provide some commentary on how the Ontario program was derived and how it compares with other leading programs around the world. Do guidelines exist for Bariatric program structure? Are these guidelines useful and would they inform clinicians with respect to the challenges being faced in program efficiency and function? Are the authors certain that the Ontario model is appropriate? How was the wait time benchmark of 1 year (referral to surgery) derived? Is this an administrative or clinically derived goal? What is the evidence behind this and is it an appropriate wait time? This is a critical point as it is being used as a metric in the measurement of 'efficiency' in program structure and function. Are their other surgical programs dealing with similar patient

	populations that can be used as models of care ie joint replacement? Why was there such a wide range in wait times (3m-4yrs)? How could a patient move through this program in only 3 months? Are there triage criteria (informal or formal) to 'fast track' certain patients? The authors have focused on operational changes in the Ontario system and how these changes impact program efficiency. Were these changes all intended to improve efficiency? Were some incidental or based on staff turnover etc? The authors have not clearly discussed program expansion as an option to enhance efficiency ie increased staff, nurses, dieticians, physicians, surgeons. Is this an option? It is tempting to move to a 'reductionist' approach to patient interactions (group model approach) in an attempt to address long wait times and program delays. Is their evidence to support this model of care and should it be recommended? What are the disadvantages of this? Follow-up is an integral part of Bariatric programs and may consume considerable resources (appropriately). How is patient follow-up organized in the Ontario program and what percent of human resource time does it consume (for RNs, RDs, MDs, Surgeons)? Do the authors have data on f/u, and has their approach to f/u changed on the specified time periods of operational change? Thank you for the opportunity to comment on this interesting study.
Author response	This is an excellent study, analysing the challenging and emerging issue of program structure and its impact on the surgical treatment of severe obesity. I would like the authors to consider several areas for improvement and I would ask them to address as many of these items as they can. Ultimately, I think with further enhancements, this manuscript will have a meaningful impact on bariatric care in Canada. 1. The authors should describe the Ontario Bariatric program in enough detail to help inform the reader on how their system works. Terms such as 'stations', 'transitions', 'assessments' etc should be clarified or unifying terms used to facilitate understanding. Perhaps a diagram of patient flow with explanations for how patients move through the process. Is each station a single encounter or are there goals that must be reached before moving on? How were these 'triggers' defined to move patients through the program? Leadership/decision making structure of the program? During the preoperative evaluation, if significant clinical and/or psychosocial issues are identified, patients are often reviewed by the interdisciplinary team before a patient can be scheduled for their next appointment. If a patient requires a specific intervention, this must be completed before a patient can move on in the program. If a patient is

	deemed ineligible for surgery, they will be removed from the program at this time. **We have created a diagram that illustrates the standard patient flow through the program, and also defines uncommon terms such as “inter-station wait time” (Figure 1). We hope this facilitates understanding. We have also clarified the decision-making structure of the program (Methods, paragraph 1, page 6). 2. Please define substance use if not already done so in the manuscript. Since any substance use (smoking, drinking alcohol, non-prescription or illicit drugs) is a contraindication for surgery, we decided to use a broad definition to identify patients who might be less likely to undergo surgery or who might take longer to complete the program; for example, because they require additional treatment or a psychosocial intervention. As well, only 42 patients with active substance use were referred to the program, so deriving conclusions based on the specific type of substance use would be difficult. **We have explained our rationale for using a broad definition of substance use within the manuscript (Methods, paragraph 3, page 7). 3. The authors should provide some commentary on how the Ontario program was derived and how it compares with other leading programs around the world. Do guidelines exist for Bariatric program structure? Are these guidelines useful and would they inform clinicians with respect to the challenges being faced in program efficiency and function? Are the authors certain that the Ontario model is appropriate? How was the wait time benchmark of 1 year (referral to surgery) derived? Is this an administrative or clinically derived goal? What is the evidence behind this and is it an appropriate wait time? This is a critical point as it is being used as a metric in the measurement of 'efficiency' in program structure and function. We have expanded our description of the study setting in the manuscript (role of the Ontario Bariatric Network), as also suggested by other comments above. The multidisciplinary care model is standard in this setting, and is recommended by the American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic & Bariatric Surgery (clinical practice guidelines). As far as we are aware, these guidelines would not inform clinicians with respect to potential program inefficiencies. Also, given that the Ontario Bariatric Network, created as part of the Ontario Bariatric Services Strategy initiated by the Ministry of Health and Long-Term Care, was only established in 2009, new research (this study included) is emerging that provides insight into limitations of a multi-stage care model with regards to operational performance.

	The target wait time of 1 year is an administrative goal. We believe that a comprehensive preoperative evaluation is necessary to identify suitable candidates for surgery (given that bariatric surgery requires substantial lifestyle changes and achieves long-term success in patients who are holistically ready for the procedure and its impact), and that patient education throughout this process likely improves patient understanding of bariatric surgery and the commitment involved. However, future research is needed to confirm these beliefs and evaluate the potential utility of a shorter wait time target in the measurement of efficiency. **We have addressed some of these issues in the manuscript, and acknowledged the need for further study in this area (Interpretation, paragraph 5, page 14). 4. Are there other surgical programs dealing with similar patient populations that can be used as models of care ie joint replacement? There are other surgical specialties that also require longitudinal multidisciplinary patient evaluation. However, bariatric surgery is unique in that it is 'elective;' whereas in surgical oncology and transplant, for instance, there are direct patient consequences in the short-term (i.e. greater urgency associated with performing surgery). **We have addressed this in the limitations section (Interpretation, paragraph 4, page 13). 5. Why was there such a wide range in wait times (3m-4yrs)? How could a patient move through this program in only 3 months? Are there triage criteria (informal or formal) to 'fast track' certain patients? Some patients were able to complete the program in only 3 months because they were referred in Period 1, when the program was just established and there was no queue for surgery or follow-up scheduling. This represents very early program performance. There are currently no triaging criteria to fast-track certain patients; although some patients, who are cleared upon initial assessment at each station, may move through the program more quickly than others, especially given the ad-hoc nature of appointment openings/scheduling practices. 6. The authors have focused on operational changes in the Ontario system and how these changes impact program efficiency. Were these changes all intended to improve efficiency? Were some incidental or based on staff turnover etc? Many of the operational changes that occurred during the study

	period, while not systematic, reflect initial program growth and responses to increased demand for surgery (e.g. improved staffing levels as referral rates increased). Moreover, the surgical target was increased in Period 2 as the program matured. However, the surgical target was decreased in Period 3, likely due to program experience and learning, and suboptimal performance in Period 2. Ultimately, our program must meet, but also stay within, service level targets, in order to demonstrate increasing demand and requirements for expansion of resources. Furthermore, the Ministry guarantees incremental funding up to a certain target volume for bariatric procedures (through setting these surgical targets). 7. The authors have not clearly discussed program expansion as an option to enhance efficiency ie increased staff, nurses, dieticians, physicians, surgeons. Is this an option? Unfortunately, due to budgetary restrictions, program expansion is not possible in the short-term. Program expansion is driven by/dependent on health human resources and since there is variability in the funding (surgical target) that is secured through the Ontario Bariatric Network, it becomes challenging for the hospital to increase the staffing complement without knowing what the longer-term efficiency requirements of the program will be. Therefore it is an organizational decision not to fund/commit to more health human resources at present. **We have addressed this issue in the paper. Furthermore, we have suggested that new approaches be taken, for example, novel scheduling practices to achieve optimization (Interpretation, paragraph 5, page 13-14). 8. It is tempting to move to a 'reductionist' approach to patient interactions (group model approach) in an attempt to address long wait times and program delays. Is their evidence to support this model of care and should it be recommended? What are the disadvantages of this? We agree that this is a very interesting idea, even for interventional purposes (e.g. substance use counselling). In fact, we are currently exploring ways to increase healthcare provider utilization using theoretical models. There is some evidence to support the group model approach (we have cited a few papers that examine this in primary care), however further research in bariatric care is needed. 9. Follow-up is an integral part of Bariatric programs and may consume considerable resources (appropriately). How is patient follow-up organized in the Ontario program and what percent of human resource time does it consume (for RNs, RDs, MDs, Surgeons)? Do the authors have data on f/u, and has their approach to f/u

	changed on the specified time periods of operational change? This point is well-taken, and we recognize this challenge. As the first patient cohorts who entered the program (in Period 1) began having surgery, scheduling of follow-up appointments became necessary (in Period 2). Unfortunately, we did not collect data on resource consumption as a result of follow-ups. We are currently investigating the optimal allocation of new versus follow-up appointment slots in the program to accommodate this added demand. Thank you for the opportunity to comment on this interesting study.