



# Leveraging mobile technologies to improve longitudinal quality and outcomes following bariatric surgery

Alirio deMeireles<sup>1,2</sup>, Rachel Ross<sup>1,2</sup>, Amir A. Ghaferi<sup>1,2</sup>

<sup>1</sup>Department of Surgery, University of Michigan, Ann Arbor, MI, USA; <sup>2</sup>Institute for Healthcare Policy and Innovation, Ann Arbor, MI, USA

Correspondence to: Amir A. Ghaferi, MD, MS. 2800 Plymouth Road, NCRC, Bldg 16 Rm 140-E, Ann Arbor, MI 48109, USA. Email: aghaferi@umich.edu.

Comment on: Coldebella B, Armfield NR, Bambling M, *et al.* The use of telemedicine for delivering healthcare to bariatric surgery patients: A literature review. *J Telemed Telecare* 2018;24:651-60.

Received: 27 January 2019; Accepted: 20 February 2019; Published: 25 February 2019.

doi: 10.21037/mhealth.2019.02.02

View this article at: <http://dx.doi.org/10.21037/mhealth.2019.02.02>

Obesity is the leading cause of death worldwide and a significant contributing factor to heart disease, diabetes, and many other life-limiting health burdens (1). In the United States alone, the prevalence of obesity rose from 30.5% in 2000 to 39.8% in 2016 and has been cited as a leading factor in the slowing of US mortality improvement over the last few decades (2,3). Without a doubt, the obesity epidemic requires careful attention as the search for medical, environmental, and health policy solutions to this complex problem continues.

Although adults with severe obesity comprise only one-third of the population of employed adults with obesity [body mass index (BMI) >30], they are responsible for nearly two-thirds of the annual excess costs attributable to obesity, amounting to more than \$40 billion per year (4). Obesity-related work absenteeism also costs employers \$9 billion dollars annually (5). Despite its poor uptake nationally, bariatric surgery is the most effective treatment for severe obesity. Nearly 40 randomized controlled trials and more than 140 observational studies over the past two decades have concluded that bariatric surgery results in greater rates of weight loss and comorbidity resolution, reduced overall mortality, and improved quality of life for severely obese patients when compared to behavioral weight loss strategies alone (6,7). On average, patients who undergo surgery lose 45–60% of their excess body weight within one year of surgery. Additionally, bariatric surgery is associated with increased long-term survival (8).

Despite favorable overall outcomes on mortality, weight loss, and comorbidity resolution, weight regain after bariatric surgery is a significant concern for many patients.

Observational studies have evaluated weight trajectories following surgery. The data indicate that most patients achieve maximum weight loss at one year, followed by gradual weight regain (9). These studies also demonstrate variability in trajectories, with some patients beginning to regain weight as early as 6 months post-surgery. Weight regain following bariatric surgery is concerning because it can lead not only to decreased quality of life, but also a return of obesity-related comorbidities that had previously resolved with bariatric surgery (e.g., hypertension, dyslipidemia, type 2 diabetes). Evidence from trials indicates the potential for behavioral interventions to slow rates of weight regain following bariatric surgery. In recent systematic reviews, nine RCTs were reviewed that tested behavioral interventions for weight loss maintenance after bariatric surgery (10,11). These interventions focused on increasing adherence to dietary recommendations such as limiting caloric intake and increasing protein intake; increasing physical activity; and addressing behavioral issues that contribute to overeating and sedentariness. Issues with design and trial implementation make it difficult to draw conclusions about the efficacy of the interventions. Despite some limitations, these studies demonstrated the potential efficacy of weight maintenance interventions.

How best to reach patients after bariatric surgery with behavioral interventions for weight maintenance and improve their overall long-term outcomes remains elusive. Currently, the ideal state would include lifelong follow-up with bariatric surgery practices. In fact, the American Society for Metabolic and Bariatric Surgery (ASMBS) requires lifelong follow-up in its national quality registry.

While this can improve the profession's understanding of the natural progression of this patient population, there is evidence supporting the benefits of long-term follow-up as well. Spaniolas and colleagues found that completion of the 3, 6, and 12 months follow up appointments was independently associated with excess body weight loss (EBWL) >50% and total weight loss >30% (12). Similarly, patients who completed scheduled annual follow up visits demonstrated significantly greater %EBWL than those who were unable to attend their appointments (13). This evidence suggests that for patients who undergo weight loss surgery, increased contact with their multidisciplinary team is associated with superior long-term outcomes.

However, a significant limitation is surgical practices lack of capacity to provide this level of face to face follow-up for all patients who have undergone bariatric surgery. Primary care clinicians may provide another group who can provide this vital service. Though, patients and their primary care clinicians may lack the necessary time, relevant knowledge, or general comfort with management of weight regain or other complications after bariatric surgery. The literature has described a multitude of factors contributing to postoperative attrition among bariatric patients (14-17). Factors associated with high rates of attrition range from socioeconomic influences to inability to miss work and distance from an urban center. It is clear that many patients are not attending their appointments due to an inability to travel to the physician. As such, it is vital that surgeons engage with patients and their primary care clinicians in novel ways. Mobile health technologies may provide this missing link.

There is currently a plethora of evidence-based resources available online from reputable sources. However, coalescing these into easily accessible and understandable tools has proven difficult. With clear benefits to patients, longitudinal follow-up must be a priority of surgical practices, patients, and payers. Novel telehealth strategies have begun to take shape in health systems (18), but have not become fully mainstream and lack standardization or interoperability. In a recent review of the literature, Coldebella and colleagues report that 9 of the 10 studies identified describe positive clinical results among postoperative patients after implementation of telemedicine technologies (19). Weinland *et al.* found that utilization of telephone support coupled with online modules is associated with improved quality of life and eating habits (20). Further, there have been several feasibility studies regarding the use of videoconferencing in the postoperative setting (21,22). Wild

*et al.* found that postoperative patients with preoperative depression symptoms had significantly improved health related quality of life and lower postoperative depression scores (22).

While initial feasibility studies and small-scale prospective trials demonstrate encouraging results, focused efforts to identify the most appropriate, effective modalities for use in patients undergoing bariatric surgery and specific implementation strategies that can lead to widespread adoption. Identifying the key stakeholders and providing suitable resources and training to succeed in these telehealth endeavors is vital. Ultimately, an integrated, inter-professional approach to the longitudinal management of obesity, especially after bariatric surgery, that incorporates mobile technologies will serve to benefit us all.

### Acknowledgements

*Funding:* Dr. Ghaferi is supported through grants from the Agency for Healthcare Research and Quality (Grant #: 5K08HS02362 and P30HS024403) and a Patient Centered Outcomes Research Institute Award (CE-1304-6596). Dr. Ghaferi receives salary support from Blue Cross Blue Shield of Michigan as the Director of the Michigan Bariatric Surgery Collaborative.

### Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

### References

1. Collaborators GB, Afshin A, Forouzanfar MH, et al. Health Effects of Overweight and Obesity in 195 Countries over 25 Years. *N Engl J Med* 2017;377:13-27.
2. Hales CM, Fryar CD, Carroll MD, et al. Trends in Obesity and Severe Obesity Prevalence in US Youth and Adults by Sex and Age, 2007-2008 to 2015-2016. *JAMA* 2018;319:1723-5.
3. Preston SH, Vierboom YC, Stokes A. The role of obesity in exceptionally slow US mortality improvement. *Proc Natl Acad Sci U S A* 2018;115:957-61.
4. Finkelstein EA, DiBonaventura M, Burgess SM, et al. The costs of obesity in the workplace. *J Occup Environ Med* 2010;52:971-6.
5. Finkelstein E, Fiebelkorn IC, Wang G. The costs of obesity among full-time employees. *Am J Health Promot*

- 2005;20:45-51.
6. Schauer PR, Kashyap SR, Wolski K, et al. Bariatric surgery versus intensive medical therapy in obese patients with diabetes. *N Engl J Med* 2012;366:1567-76.
  7. Jakobsen GS, Smastuen MC, Sandbu R, et al. Association of Bariatric Surgery vs Medical Obesity Treatment With Long-term Medical Complications and Obesity-Related Comorbidities. *JAMA* 2018;319:291-301.
  8. Arterburn DE, Olsen MK, Smith VA, et al. Association between bariatric surgery and long-term survival. *JAMA* 2015;313:62-70.
  9. King WC, Hinerman AS, Belle SH, et al. Comparison of the Performance of Common Measures of Weight Regain After Bariatric Surgery for Association With Clinical Outcomes. *JAMA* 2018;320:1560-9.
  10. Ryan RM, Patrick H, Deci EL, et al. Facilitating health behaviour change and its maintenance: Interventions based on self-determination theory. *European Health Psychologist* 2008;10:2-5.
  11. Teixeira PJ, Carraca EV, Markland D, et al. Exercise, physical activity, and self-determination theory: a systematic review. *Int J Behav Nutr Phys Act* 2012;9:78.
  12. Spaniolas K, Kasten KR, Celio A, et al. Postoperative Follow-up After Bariatric Surgery: Effect on Weight Loss. *Obes Surg* 2016;26:900-3.
  13. Gould JC, Beverstein G, Reinhardt S, et al. Impact of routine and long-term follow-up on weight loss after laparoscopic gastric bypass. *Surg Obes Relat Dis* 2007;3:627-30; discussion 630.
  14. Khorgami Z, Zhang C, Messiah SE, et al. Predictors of Postoperative Aftercare Attrition among Gastric Bypass Patients. *Bariatric Surg Pract Patient Care* 2015;10:79-83.
  15. Moroshko I, Brennan L, O'Brien P. Predictors of attrition in bariatric aftercare: a systematic review of the literature. *Obes Surg* 2012;22:1640-7.
  16. Sivagnanam P, Rhodes M. The importance of follow-up and distance from centre in weight loss after laparoscopic adjustable gastric banding. *Surg Endosc* 2010;24:2432-8.
  17. Vidal P, Ramon JM, Goday A, et al. Lack of adherence to follow-up visits after bariatric surgery: reasons and outcome. *Obes Surg* 2014;24:179-83.
  18. Nikolian VC, Williams AM, Jacobs BN, et al. Pilot Study to Evaluate the Safety, Feasibility, and Financial Implications of a Postoperative Telemedicine Program. *Ann Surg* 2018;268:700-7.
  19. Coldebella B, Armfield NR, Bambling M, et al. The use of telemedicine for delivering healthcare to bariatric surgery patients: A literature review. *J Telemed Telecare* 2018;24:651-60.
  20. Weineland S, Arvidsson D, Kakoulidis TP, et al. Acceptance and commitment therapy for bariatric surgery patients, a pilot RCT. *Obes Res Clin Pract* 2012;6:e1-90.
  21. Morrow E, Bruce DM, Bruce E, et al. Post surgical review of bariatric surgery patients: a feasibility study of multidisciplinary follow up using videoconferencing. *Clin Pract Epidemiol Ment Health* 2011;7:84-8.
  22. Wild B, Hunnemeyer K, Sauer H, et al. A 1-year videoconferencing-based psychoeducational group intervention following bariatric surgery: results of a randomized controlled study. *Surg Obes Relat Dis* 2015;11:1349-60.

doi: 10.21037/mhealth.2019.02.02

**Cite this article as:** deMeireles A, Ross R, Ghaferi AA. Leveraging mobile technologies to improve longitudinal quality and outcomes following bariatric surgery. *mHealth* 2019;5:6.