Complementary Therapies in Clinical Practice xxx (2013) 1–5

Contents lists available at ScienceDirect

Complementary Therapies in Clinical Practice

journal homepage: www.elsevier.com/locate/ctcp

A weight loss program in a chiropractic practice: A retrospective analysis

Anthony DeMaria [a,1], Casen DeMaria [a,1], Robert DeMaria [a,1], Joel Alcantara [b,c,*]

[a] 362 E Bridge St., Elyria, OH 44035, USA
[b] International Chiropractic Pediatric Association, 327 N Middletown Rd, Media, PA 19063, USA
[c] Life Chiropractic College West, 25001 Industrial Blvd Hayward, CA 94545, USA

Keywords:
Weight loss
Chiropractic
Exercise
Diet
Counseling

A B S T R A C T

Context: Obesity is a global problem and places individuals at risk for developing chronic metabolic disorders. The need for investigating simple, effective and sustaining approaches to weight loss cannot be overstated.

Methods: We performed a retrospective file analysis of patient files attending a 13-week weight loss program. Inclusion for analysis were files of adults (i.e., >18 years) completing the program consisting of chiropractic adjustments/spinal manipulative therapy augmented with diet/nutritional intervention, exercise and one-on-one counseling.

Results: Sixteen of 30 people (i.e., 53.33%) completed the program. Statistically and clinically significant changes were noted in weight and BMI measures based on pre-treatment (average weight = 190.46 lbs. and BMI = 30.94 kg/m^2) and comparative measurements (average weight = 174.94 lbs. and BMI = 28.50 kg/m^2).

Conclusion: A cohort of patients under enrolled in a weight loss program was described. This provides supporting evidence on the effectiveness of a multi-modal approach to weight loss implemented in a chiropractic clinic.

1. Introduction

A significant proportion of the population in Canada and the United States are overweight (i.e., defined as body mass index (BMI) of ≥25 kg/m^2) or obese (i.e., defined as BMI of ≥30 kg/m^2) [1] and represents a significant public health problem since both conditions are strongly correlated with an increase risk for diabetes, hypertension, dyslipidemia, metabolic syndrome and other obesity-related illnesses and death [2]. In Canada; based on the 2007–2009 Canadian Health Measures survey, approximately 62% of the adult population is overweight and 24.3% are obese [3]. In the United States, the latest National Health and Nutrition Examination Surveys (NHANES) (2007–2008) revealed that approximately 68% of the population was overweight or obese, and approximately 34% were obese [4]. According to a 2013 statistical fact sheet from the American Heart Association [5], 23.9 million children between the age of 2–19 years are overweight or obese. Among Americans age 20 and older, 154.7 million are overweight or obese (BMI of 25.0 kg/m^2 and higher).

The World Health Organization, through their Global Database on BMI estimates in 2005, found that approximately 1.6 billion people were overweight with 400 million of them as obese. The prevalence of obesity is wide with 1% or less of the Indian population to over 80% of the Pacific Islands [1,6]. Projections are that by 2015, approximately 2.3 billion adults will be overweight and that at least 700 million will be obese [1].

A recent evaluation on the clinical effectiveness and cost-effectiveness of three pharmacological interventions in obese patients found measures of clinical effectiveness and cost-effectiveness but highlighted safety concerns since some of these pharmacological agent/medications have been withdrawn from the market due to potential treatment-induced fatal adverse events [7]. Given the threat of obesity and overweight to public health on a global basis, there is an urgent need to find simple, effective and safe weight loss strategies and programs.

Chiropractic, with a holistic and patient-centered paradigm of care that incorporates the principles of vitalism, holism, humanism, conservatism, naturalism, and rationalism [8] may provide a unique

* Corresponding author. International Chiropractic Pediatric Association, 327 N Middletown Rd, Media, PA 19063, USA. Tel.: +1 408 759 0141; fax: +1 610 565 2310.
E-mail addresses: ademaria3@gmail.com (A. DeMaria), jalcantara@lifewest.edu, dr_jalcantara@yahoo.com (J. Alcantara).
[1] Tel.: +1 440 323 3840.

1744-3881/$ – see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.ctcp.2013.11.007

opportunity in the primary care setting to implement successful weight loss program.

In the interest of evidence-informed practice, we performed a retrospective file review in a multi-chiropractor practice implementing a weight loss program to determine some measure of effectiveness.

2. Methods

A retrospective file review was performed by chiropractors in a muli-practitioner clinic implementing a 13-week weight loss program. The 13-week program consisted of a combination of diet, exercise, and chiropractic spinal manipulation within a multi-practitioner chiropractic clinic. Prior to beginning the 13-week program, each patient/subject underwent a history and physical examination to rule out contraindications to chiropractic SMT and components of the weight loss program undertaken. Each individual's baseline (pre-treatment) weight and body fat was determined and individually, the subjects were instructed on what foods to eat and avoid, provided nutritional supplement recommendations and instructed on a specific exercise program tailored for each individual. An instructional packet on diet, diet restrictions and specific exercises was also provided to each individual to augment the instructions they received along with a daily log book. The weight loss program was individualized according to each individual's needs based on their dietary requirements and physical activity capabilities. The log book was provided to document/monitor each patient's dietary intake and exercise performed. Each week the attending chiropractor, in consultation with each subject, examined the food and exercise log and made recommendations as necessary. Also, each week, the individuals were weighed with the weight recorded. For the retrospective file review, inclusion criteria for this study included: (a) the patient underwent a diagnostic work-up including a history and physical examination to screen for co-morbidities and signs and symptoms indicative of a contraindication to chiropractic SMT and the weight loss program undertaken; (b) the subject was compliant with the 13-week program and (c) pre-treatment and comparative variables (i.e., weight, body mass index) were available.

The file review was performed by one of the attending clinicians involved in executing the 13-week weight loss program. The data was compiled into an Excel spreadsheet (Excel, Microsoft Corp). In addition to patient demographics (i.e., age, gender), we examined for weight loss body mass index based on pre-13-week program and comparative variables. Categorical data were analyzed using descriptive statistics (i.e., frequency distributions and percentages) while pre-treatment and comparative variables were analyzed using the Wilcoxon Signed Rank Test [9].

Table 1
Pre-treatment (W_{PreTx}) and comparative ($W_{Compare}$) weight measures.

Subject	Gender	Age (years)	W_{PreTx} (lbs)	$W_{Compare}$ (lbs)	$\Delta W_{PreTx} - W_{Compare}$ (lbs)
1	F	62	150.2	137.1	13.1
2	F	67	166	157.1	8.9
3	F	66	202	189.5	12.5
4	F	54	120	113.8	6.2
5	F	59	178.6	162.5	16.1
6	F	53	207	181	26
7	F	69	164	160.4	3.6
8	F	47	178	172	6
9	F	62	164	144.8	19.2
10	M	50	198	180.7	17.3
11	F	56	194.3	183.2	11.1
12	M	66	200	181	19
13	F	67	192	186.1	5.9
14	F	77	290	259	31
15	M	59	332	286.3	45.7
16	F	57	111.4	104.5	6.9

Table 2
Pre-treatment ($BMI_{Pre\text{-}Tx}$) and comparative BMI ($BMI_{Compare}$) measures.

Subject	Gender	Age (years)	$BMI_{Pre\text{-}Tx}$ (kg/m^2)	$BMI_{Compare}$ (kg/m^2)
1	F	62	28	24
2	F	67	29	27
3	F	66	32	29
4	F	54	21	20
5	F	59	32	30
6	F	53	35	32
7	F	69	30	30
8	F	47	30	30
9	F	62	25	22
10	M	50	29	28
11	F	56	30	29
12	M	66	28	26
13	F	67	36	34
14	F	77	47	40
15	M	59	42	36
16	F	57	21	19

3. Results

Our review found a completion rate of 53% with 30 individuals initiating the 13-week program and 16 individuals met our inclusion criteria. Of the 16 subjects, 3 were males and 13 were females. Their average age was 60.69 years (median = 60.5 years; mode = 62,67,66 and 59 years; range of 47–77 years). The pre-treatment and comparative individual weight and BMI values are provided in Tables 1and 2, respectively. The cohort's mean weight and mean BMI prior to initiating the 13-week program was 190.46 lbs. and 30.94 kg/m^2, respectively. The majority of the cohort ($N = 9$) was obese while 5 individuals were overweight, based on the pre-defined BMI values. Following the 13-week program, the cohort mean comparative weight was 174.94 lbs. resulting in an average loss of 15.531 lbs. This decrease in mean weight was statistically significant based on the Wilcoxon Signed Rank Test analysis with the following values: $W = 136$; $Ns/r = 16$; $z = 3.5$. From a table of critical values of z, the observed value of $z = +3.5$ was significant beyond the .0005 level for a two-tailed non-directional test. The comparative cohort mean BMI was 28.50 kg/m^2, indicating a mean loss of 2.44 kg/m^2. This decrease in mean BMI was statistically significant based on the Wilcoxon Signed Rank Test with the following values: $W = 105$; $Ns/r = 14$; $z = 3.28$. From a table of critical values of z, the observed value of $z = +3.28$ is significant beyond the .001 level for a two-tailed non-directional test.

Of the 16 individuals completing the program, we found 5 individuals with pre-treatment and comparative HA1C blood test results. This is provided in Table 3. The mean HbA1C pre-treatment and comparative measures were 5.56 mmol/mol and 5.40 mmol/

Table 3
Pre-treatment ($HbA1C_{Pre\text{-}Tx}$) and comparative ($HbA1C_{Pre\text{-}Tx}$) glycosylated hemoglobin measures.

Subject#	Genders	Age	$HbA1C_{Pre\text{-}Tx}$	$HbA1C_{Compare}$	%
2	F	67	5.9	5.4	8.5%
4	F	54	5.5	5.3	3.6%
7	F	69	5.8	5.9	−1.7%
9	F	62	5.7	5.6	1.8%
10	M	50	4.9	4.8	2.0%

Please cite this article in press as: DeMaria A, et al., A weight loss program in a chiropractic practice: A retrospective analysis, Complementary Therapies in Clinical Practice (2013), http://dx.doi.org/10.1016/j.ctcp.2013.11.007

mol, respectively. As you can observe from Table 3, the mean change was 2.84% (range −1.7%–8.55%; SD = 3.71).

4. Discussion

As previously highlighted, overweight and obesity in the general population worldwide are in epidemic proportions and contributes significantly to chronic disease epidemiology. Mitchell and colleagues [10] in their review of this epidemic cited the variety of health risks associated with obesity and include Type 2 diabetes and pre-diabetes, dyslipidemia, coronary artery disease and hypertension, sleep apnea, cognitive dysfunction (i.e., stroke), liver disease (i.e., non-alcoholic fatty liver disease, cirrhosis and hepatocellular carcinoma), colorectal polyps and cancer to list a few. In terms of dollar costs, estimates from the U.S. Department of Health and Human Services places the total economic cost of overweight and obesity in the United States at $117 billion based on 1995 data. However, since the prevalence of overweight and obesity has continued to increase since 1995, the costs today are more likely to be much higher than this estimate. Over a decade ago, Finkelstein et al. [11] projected the annual medical spending due to overweight and obesity at $92.6 billion based on 2002 figures, or about 9% of US health expenditures at that time.

Despite acknowledging that obesity is caused by a complex interaction between human behavior, the environment and genetic predisposition, its successful prevention and treatment remains wanting in clinical practice. The framework proposed by Popkinor [12] and Bouchard [13] views that energy imbalance (i.e., energy intake exceeds energy expenditures) and weight gain result from large shifts in both diet and physical activity patterns. Unfortunately, the relative contribution of factors such as diet and nutrition (i.e., energy intake) and physical activity/exercise (i.e., energy expenditure) remains poorly understood particularly in the context of the individual's genetic predisposition. Much debate continues on the merits of each strategy (control energy expenditure or energy intake or both) for an effective population-based strategy. It is beyond the scope of this paper to review all the relevant material. We recommend the up-to-date review by Millward [14] on this topic. The genetic predisposition for obesity has been demonstrated. To date, 52 genetic loci have been identified to be unequivocally associated with obesity-related traits. However, these loci contributes only a small amount to obesity-susceptibility and explains just a fraction of the total variance. For example, the 52 currently identified traits account for only a total of 6–7% of the variance in BMI. As such, their accuracy to predict obesity is poor and not competitive with the predictive ability of traditional risk factors such as inactivity and poor diet [15].

Plourde and Prud'homme [16] reviewed the most recent and strongest evidence-based strategies that may assist primary care physicians in the care of patients with obesity to lose weight and maintain their weight loss. With respect to counseling patients, there is strong evidence (level I) that the 5A model (assess/ask, advise, agree, assist, arrange) of behavioral change, adapted from tobacco cessation interventions in clinical care, can be effective in helping patients modify their health behavior and promoting physical activity [17–19]. In terms of dietary intervention, Plourde and Prud'homme [16] suggest that dietary adherence and caloric restriction are more important than macronutrient composition in determining weight loss (level I evidence). In terms of physical activity only, the authors cite a Cochrane review [20] of 43 randomized controlled trials demonstrating that exercise-only interventions can result in a marginal mean weight loss. To assess the effects of psychological interventions for overweight or obesity as a means of achieving sustained weight loss, Shaw et al. [21] found a total of 36 studies consisting of 3495 participants. The majority of studies assessed behavioral and cognitive-behavioral weight reduction strategies. Cognitive therapy, psychotherapy, relaxation therapy and hypnotherapy were assessed in a small number of studies. Behavior therapy was found to result in significantly greater weight reductions than placebo when assessed as a stand-alone weight loss strategy. However, when behavior therapy was combined with a diet and exercise approach and compared with diet and exercise alone, the combined intervention resulted in a greater weight reduction.

4.1. Chiropractic weight loss programs

A number of barriers for physicians exist to managing obesity that include a lack of time, resources/support and knowledge [16,22–29]. A window that this holds true for chiropractors can be gleaned from the study by Ndetan and colleagues [30]. Based on an analyses of data from the Sample Adult Core component of the 2006 National Health Interview Survey ($N = 24{,}275$). Ndetan and his colleagues analyzed for recommendation and compliance of weight loss, increase exercise, and diet change by health profession subtype (i.e., chiropractor and medical doctor). The investigators found that about 30.5% of the respondents reported receiving advice from their provider with 88.0% in this group indicating compliance with the advice they received. Chiropractors were less likely to advise patients compared to medical doctors. The subject needs further investigation since it is our informed opinion that chiropractors are better trained in counseling patients on nutrition/dietetics than medical physicians [31] and are more likely to address this topic with their patients. In a survey of New York chiropractors, 80% of the respondents indicated that they incorporate some form of nutritional counseling into their practices [32]. This is consistent with the findings of Hawk et al. [33] that a substantial proportion of chiropractic interns, academic faculty and practitioners provide information to patients on musculoskeletal risk reduction, exercise, diet, stress reduction, and injury prevention. In terms of chiropractic patients, the secondary analyses of the National Health Interview Survey 2005 ($N = 31{,}248$) to assess associations of health conditions/risk behaviors of patients with their doctors (chiropractors versus medical doctors) by Ndetan and colleagues [34] found no significant difference in smoking/alcohol consumption status, but chiropractor-only patients were more likely to be physically active and less likely to be obese.

We are aware of only a handful of studies implementing a weight loss program in chiropractic practice. Morningstar and colleagues [35] reported on a 52-year-old man with chronic low back pain. Due to the patient's non-responsiveness to spinal manipulation, radiographic examination was performed which was unremarkable. Laboratory testing revealed the patient with hypercholesterolemia, hyperlipidemia, uricemia, and elevated blood glucose. A dietary treatment approach was instituted with the patient ingesting 10 drops of a homeopathic human chorionic gonadotropin product under the tongue 5 times daily. His total daily energy (calorie) was limited for the first 30 days of the program while on the homeopathic product. After 4 months, the patient lost a total of 71 lbs, his pain and disability scores improved with reductions in serum cardiovascular markers. Balliette and colleagues [36] reported on their findings of 30 healthy subjects (age range = 20–60 years; 23 women: 7 men) participating in a 28-day diet intervention consisting of a cleansing day and 6 restricted diet days per week. On cleansing days, the subjects drank 4 oz. of tea 4 times per day with a recommendation to drink at least 64 oz. of filtered water. On the restricted diet days, the subjects drank 2 high-protein meal replacement shakes, consumed one 400- to 600-cal (1674.3–2511.5 J) meal consisting of low-glycemic index foods, and drank at least 64 oz. of filtered water. The investigators found

Please cite this article in press as: DeMaria A, et al., A weight loss program in a chiropractic practice: A retrospective analysis, Complementary Therapies in Clinical Practice (2013), http://dx.doi.org/10.1016/j.ctcp.2013.11.007

that a low-glycemic load diet intervention incorporating tea and high-protein meal replacement shakes may cause weight loss and improve lipid profiles. Multiple paired *t*-tests detected reductions in weight, waist circumference, and hip measurements and in total cholesterol and low-density lipoprotein cholesterol. Multiple paired *t*-tests detected significant increases in energy metabolism from carbohydrates and amino acids and concomitant increases in oxidative stress. McCoy [37] examined a standardized, commercial wellness protocol (i.e., Creating Wellness) that focused on diet, exercise, vitamin supplementation, and one-on-one coaching to improve anthropometric and physiologic function and reduces health risk factors. The author found that of 178 subjects completing an 18-week protocol, all anthropometric and physiologic measures (i.e., weight, heart rate, blood pressure, strength, body mass index, and forced vital capacity) showed significant improvement following the intervention.

The 13-week weight loss program described in this file review was implemented under the banner of "chiropractic care." In this instance, chiropractic care consisted of the application of spinal adjustments (or spinal manipulation) and adjunctive therapies (i.e., dietary intervention, exercise, nutritional counseling). Our findings should not be misunderstood that we are providing a measure of evidence on the effectiveness of the weight loss program due to chiropractic spinal manipulation alone. We are not aware of any studies examining the effects of spinal manipulation solely as an intervention for weight loss or in comparison to diet versus exercise or combinations thereof. As described, previous chiropractic studies described a similar scenario (i.e., "chiropractic care") with diet, exercise and one-on-one counseling as the main focus for weight loss. As discussed previously, it may be that the chiropractors implementing this 13-week-program spent more time (when compared than general medical practitioners) with their patients and possessed unique qualifications in exercise and nutritional counseling, which may have influenced the outcomes described.

The main outcome measure for our file review was change in BMI and individual weight loss. Our cohort mean BMI decreased on average of 2.44 kg/m^2. To place this proper context, BMI changes indicate that all-cause mortality increases by about 30% for each 5-unit increase in BMI above the reference minimum mortality range of 20.0 to 24.9 kg/m^2 [38,39]. For two subjects, they experienced changes in BMI by 6 and 7 units, one by 4 units, 3 subjects by 3 BMI units, 5 subjects by 2 BMI units and 3 subjects by 1 BMI units. Two subjects did not change in their BMI despite losing weight. This does not mean that these two subjects did not benefit from the program. There are indications from studies that indicate that lifestyle-modification characterized by an increase in physical activity and a balanced diet can still reduce the risk of obesity-related comorbid conditions despite minimal or no weight loss [40–44]. With respect to the HbA1C, the 5 subjects had a mean change of 2.84%. A change of .5% HbA1c is considered a clinically significant change based on treatment guidelines from ADA/EASD and NICE [45]. Finally, our file review found an attrition rate of 47%. It is imperative that attrition rates are taken into consideration when implementing a weight loss program. An examination of clinical trials examining weight loss with medication found a high attrition rate [46]. Older age, less episodes of depression, non-smoking status, higher levels of physical activity or exercise, weight loss expectations and gender have been found as predictors of attrition [46–49]. However, the true causes of attrition remains uncertain [50]. Insofar as these apply to our file review, older age and gender (i.e., women have higher attrition rates) may have contributed to the high attrition found.

Despite the advantages in retrospective file methodologies (i.e., they are relatively inexpensive, allows for use of existing records, allows for hypothesis testing) we would be remissed if we did not acknowledged its limitations. Given the retrospective nature of the study, important data may not be made available, bias and confounders abound and are difficult to control and therefore difficult to establish cause and effect [45].

5. Conclusion

This retrospective file review demonstrates that individuals with the desire to lose weight may do so under chiropractic care characterized as spinal adjustments supported by adjunctive therapy (i.e., diet, exercise and nutritional counseling).

Conflict of interest statement

Dr. Alcantara receives funding and/or support from the International Chiropractic Pediatric Association (Media, PA, USA) and Life Chiropractic College West (Hayward, CA, USA).

Funding statement

This study was funded by the International Chiropractic Pediatric Association (Media, PA, USA) and Life Chiropractic College West (Hayward, CA, USA).

References

[1] World Health Organization. Obesity. Accessed Jun 20, 2013 at: http://www.who.int/topics/obesity/en/; 2008.
[2] Douketis JD, Paradis G, Keller H, Martineau C. Canadian guidelines for body weight in adults: application in clinical practice to screen for overweight and obesity and to assess disease risk. CMAJ 2005;172:995–8.
[3] Shields M, Tremblay MS, Laviolette M, Craig CL, Janssen I, Connor Gorber S. Fitness of Canadian adults: results from the 2007–2009 Canadian health measures survey. Health Rep 2010;21:21–35.
[4] Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999–2008. JAMA 2010;303:235–41.
[5] Overweight & ObesityStatistical fact sheet. Accessed November 16, 2013 at: http://www.heart.org/idc/groups/heart-public/@wcm/@sop/@smd/documents/downloadable/ucm_319588.pdf; 2013.
[6] Nguyen DM, El-Serag HB. The epidemiology of obesity. Gastroenterol Clin North Am 2010;39(1):1–7.
[7] Ara R, Blake L, Gray L, Hernandez M, Crowther M, Dunkley A, et al. What is the clinical effectiveness and cost-effectiveness of using drugs in treating obese patients in primary care? A systematic review. Health Technol Assess 2012;16(5):iii–xiv. 1-195.
[8] Gatterman MI. A patient-centered paradigm: a model for chiropractic education and research. J Altern Complement Med 1995 Winter;1(4):371–86.
[9] Wilcoxon-signed rank test Accessed at: http://www.vassarstats.net/wilcoxon.html.
[10] Mitchell NS, Catenacci VA, Wyatt HR, Hill JO. Obesity: overview of an epidemic. Psychiatr Clin North Am 2011;34(4):717–32.
[11] Finkelstein EA, Fiebelkorn IC, Wang G. State-level estimates of annual medical expenditures attributable to obesity. Obes Res 2004;12(1):18–24.
[12] Popkin BM. Using research on the obesity pandemic as a guide to a unified vision of nutrition. Public Health Nutr 2005;8:724–9.
[13] Bouchard C. The biological predisposition to obesity: beyond the thrifty genotype scenario. Int J Obes 2007;31:1337–9.
[14] Millward DJ. Energy balance and obesity: a UK perspective on the gluttony v. sloth debate. Nutr Res Rev 2013:1–21.
[15] Loos RJ. Genetic determinants of common obesity and their value in prediction. Best Pract Res Clin Endocrinol Metab 2012;26(2):211–26.
[16] Plourde g, prud'homme D. Managing obesity in adults in primary care. CMAJ 2012;184(9):1039–44.
[17] Whitlock EP, Orleans T, Pender N, Allan J. Evaluating primary care behavioral counseling interventions: an evidence-based approach. Am J Prev Med 2002;22:267–84.
[18] Meriwether RA, Lee JA, Schroeder Lafleur A, Wiseman P. Physical activity counselling. Am Fam Physician 2008;77:1029–1136, 1138.
[19] Beaulac J, Carlson AM, Boyd RJ. Counseling on physical activity to promote mental health: practical guidelines for family physicians. Can Fam Physician 2011;57:399–401.
[20] Shaw K, Gennat HC, O'Rourke P, Del Mar C. Exercise for overweight or obesity. Cochrane Database Syst Rev 2006;1:CD003817.
[21] Shaw K, O'Rourke P, Del Mar C, Kenardy J. Psychological interventions for overweight or obesity. Cochrane Database Syst Rev 2005;2:CD003818.
[22] Alexander SC, Østbye T, Pollak KI, Gradison M, Bastian LA, Brouwer RJ. Physicians' beliefs about discussing obesity: results from focus groups. Am J Health Promot 2007;21(6):498–500.

Please cite this article in press as: DeMaria A, et al., A weight loss program in a chiropractic practice: A retrospective analysis, Complementary Therapies in Clinical Practice (2013), http://dx.doi.org/10.1016/j.ctcp.2013.11.007

[23] Fogelman Y, Vinker S, Lachter J, Biderman A, Itzhak B, Kitai E. Managing obesity: a survey of attitudes and practices among Israeli primary care physicians. Int J Obes Relat Metab Disord 2002;26(10):1393–7.
[24] Forman-Hoffman V, Little A, Wahls T. Barriers to obesity management: a pilot study of primary care clinicians. BMC Fam Pract 2006;7:35.
[25] Bocquier A, Verger P, Basdevant A, Andreotti G, Baretge J, Villani P, et al. Overweight and obesity: knowledge, attitudes, and practices of general practitioners in France. Obes Res 2005;13(4):787–95.
[26] Kristeller JL, Hoerr RA. Physician attitudes toward managing obesity: differences among six specialty groups. Prev Med 1997;26(4):542–9.
[27] Ampt AJ, Amoroso C, Harris MF, McKenzie SH, Rose VK, Taggart JR. Attitudes, norms and controls influencing lifestyle risk factor management in general practice. BMC Fam Pract 2009;10:59.
[28] Jochemsen-van der Leeuw HG, van Dijk N, Wieringa-de Waard M. Attitudes towards obesity treatment in GP training practices: a focus group study. Fam Pract 2011;28(4):422–9.
[29] Hansson LM, Rasmussen F, Ahlstrom GI. General practitioners' and district nurses' conceptions of the encounter with obese patients in primary health care. BMC Fam Pract 2011;12:7.
[30] Ndetan H, Evans Jr MW, Bae S, Felini M, Rupert R, Singh KP. The health care provider's role and patient compliance to health promotion advice from the user's perspective: analysis of the 2006 National Health Interview Survey data. J Manipulative Physiol Ther 2010;33(6):413–8.
[31] Coulter I, Adams A, Coggan P, Wilkes M, Gonyea M. A comparative study of chiropractic and medical education. Altern Ther Health Med 1998;4(5):64–75.
[32] Holtzman D, Burke J. Nutritional counseling in the chiropractic practice: a survey of New York practitioners. J Chiropr Med 2007;6(1):27–31.
[33] Hawk C, Long CR, Perillo M, Boulanger KT. A survey of US chiropractors on clinical preventive services. J Manipulative Physiol Ther 2004;27(5):287–98.
[34] Ndetan HT, Bae S, Evans Jr MW, Rupert RL, Singh KP. Characterization of health status and modifiable risk behavior among United States adults using chiropractic care as compared with general medical care. J Manipulative Physiol Ther 2009;32(6):414–22.
[35] Morningstar MW, Strauchman MN. Changes in chronic low back pain and cardiovascular risk factors using a homeopathic human chorionic gonadotropin-based weight loss program: a case report. J Chiropr Med 2011;10(4):322–6.
[36] Balliett M, Rasmussen O, Burke JR. Effects of tea combined with high-protein meal replacement shakes on anthropometric measurements, lipid profiles, cellular biochemistry, neurochemistry, and microbial metabolism: a prospective observational study. J Chiropr Med 2011;10(4):272–82.
[37] McCoy M. Evaluation of a standardized wellness protocol to improve anthropometric and physiologic function and to reduce health risk factors: a retrospective analysis of outcome. J Altern Complement Med 2011;17(1):39–44.
[38] Prospective Studies Collaboration, Whitlock G, Lewington S, Sherliker P, Clarke R, Emberson J, et al. Body-mass index and cause-specific mortality in 900 000 adults: collaborative analyses of 57 prospective studies. Lancet 2009;373(9669):1083–96.
[39] Berrington de Gonzalez A, Hartge P, Cerhan JR, Flint AJ, Hannan L, MacInnis RJ, et al. Body-mass index and mortality among 1.46 million white adults. N Engl J Med 2010;363:2211–9.
[40] Kolasa KM, Collier DN, Cable K. Weight-loss strategies that really work. J Fam Pract 2010;59:378–85.
[41] Plourde G. Treating obesity: lost cause or new opportunity? Can Fam Physician 2000;46:1806–13. 41.
[42] Hussain SS, Bloom SR. The pharmacological treatment and management of obesity. Postgrad Med 2011;123:34–44.
[43] Pryke R, Docherty A. Obesity in primary care: evidence for advising weight constancy rather than weight loss in unsuccessful dieters. Br J Gen Pract 2008;58:112–7.
[44] Nathan DM, Buse JB, Davidson MB, Ferrannini E, Holman RR, Sherwin R, et al., American Diabetes Association, European Association for Study of Diabetes. Medical management of hyperglycemia in type 2 diabetes: a consensus algorithm for the initiation and adjustment of therapy: a consensus statement of the American Diabetes Association and the European Association for the Study of Diabetes. Diabetes Care 2009;32(1):193–203.
[45] Hess DR. Retrospective studies and chart reviews. Respir Care 2004;49(10):1171–4.
[46] Fabricatore AN, Wadden TA, Moore RH, Butryn ML, Heymsfield SB, Nguyen AM. Predictors of attrition and weight loss success: results from a randomized controlled trial. Behav Res Ther 2009;47:685–91. External Resources.
[47] Honas JJ, Early JL, Frederickson DD, O'Brien MS. Predictors of attrition in a large clinic-based weight-loss program. Obes Res 2003;11:888–94. External Resources.
[48] Anton SD, Martin CK, Redman L, York-Crowe E, Heilbronn LK, Han H, et al. Psychosocial and behavioral pre-treatment predictors of weight loss outcomes. Eat Weight Disord 2008;13:30–7. External Resources.
[49] Dalle Grave R, Calugi S, Molinari E, Petroni ML, Bondi M, Compare A, et al. Weight loss expectations in obese patients and treatment attrition: an observational multicenter study. Obes Res 2005;13:1961–9.
[50] Handjieva-Darlenska T, Holst C, Grau K, Blaak E, Martinez JA, Oppert J-M, et al. Clinical correlates of weight loss and attrition during a 10- week dietary intervention study: results from the NUGENOB project. Obes Facts 2012;5:928–36.

Please cite this article in press as: DeMaria A, et al., A weight loss program in a chiropractic practice: A retrospective analysis, Complementary Therapies in Clinical Practice (2013), http://dx.doi.org/10.1016/j.ctcp.2013.11.007