IFAST

Intermittent Fasting Adherence and Self-Tracking

Version 1.2

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1. Background

1.1. Non-Pharmacologic Interventions to Improve Blood Pressure Control

Despite the wide availability of multiple classes of antihypertensive agents, compelling data that blood pressure (BP) lowering reduces mortality and cardiovascular events, and decades of public health campaigns, half of American adults with hypertension do not achieve adequate BP control.[1–3] Randomized controlled trials of interventions to improve BP control in patients with hypertension have largely focused on home blood pressure monitoring, nurse- or pharmacist-lead education and medication titration, and/or financial incentives. Though many of these interventions improve short-term blood pressure control,[4–10] they are cost-additive to health systems,[11] post-intervention data is mixed,[12,13] and none have been widely implemented.

Though consensus guidelines recommend dietary changes to improve hypertension control, with a particular recommendation in favor of the DASH (Dietary Approaches to Stop Hypertension) diet,[14,15] very few U.S. patients adhere to this complex dietary pattern.[16,17] The DASH diet reduced systolic BP (SBP) by 11 mmHg in randomized controlled trials in which participants were provided with food,[18,19] and 4 mmHg in a study testing a 6-month, 18-visit intensive lifestyle intervention intended to promote the DASH diet;[20] however, BP control was not sustained 12 months after the end of the intensive intervention.[21]

1.2. Effect of Intermittent Fasting on Metabolic Parameters

In contrast to the DASH diet, intermittent fasting (IF) is a dietary pattern that emphasizes temporal restriction of caloric intake rather than restricting the number of calories and/or changing the types of foods eaten.[22] The simplest and most popular variation of IF involves restricting caloric intake to an 8-hour period each day, and consuming no calories for the other 16 hours (so-called 16:8 time-restricted feeding).[23] In animal studies, IF has been shown to activate cellular pathways with potential disease-modifying benefits in a number of conditions.[22] In small human studies, IF is associated with a reduction in SBP by 5-10 mmHg, LDL cholesterol by ~8 mg/dl, and weight by ~ 3 kg, though none of the studies of a time-restricted feeding regimen included concurrent controls.[23–29] Some patients report that IF is easier to initiate and maintain than other dietary patterns, though this has not been tested empirically.[30]

1.3. Commitment Devices to Promote Healthy Behaviors

Commitment devices are centered in theoretical research that posits a planner-doer framework, wherein an individual can be conceptualized as dual sub-selves: The planner, who cares about long-term well-being; and the doer, who cares only for the present and prioritizes immediate payoffs.[31] Conflict between the motivations and priorities of the planner and the doer sub-selves results in failure to follow-through with a plan when the moment to act arrives.[32] Commitment devices are mechanisms by which the planner sub-self constrains the actions of their future doer sub-self by making certain choices more costly.[33] Hard commitments impose a financial penalty for failing to follow through on the commitment, and soft commitments impose a psychological penalty. Hard commitments have been shown to change health behaviors, as in a study where smokers forfeited money deposited in a savings account if they failed to quit smoking after 6 months.[34] However, monetary losses may not be attractive to many people, and effective soft commitment devices may be more appealing.[33]

Pre-clinical research suggests that both intra- and interpersonal commitments might be useful components of a soft commitment device. Intrapersonal commitments have also been framed as implementation intentions, or specific plans as to where, how, and/or when an action will be taken.[35] In small experiments, smokers who set a quit date were more likely to quit, and college students who set a date and time to visit a vaccination clinic were more likely to receive their vaccination.[36,37] Interpersonal commitments leverage social networks, so that the penalty involves letting down a support partner.[38] Involvement of social networks has been used to increase physical activity and improve control of weight and blood glucose in patients with obesity and diabetes.[39–42] Social networks have been used explicitly within the context of commitment devices to encourage deposits in a savings account in a study of Chilean micro-entrepreneurs who either attended or did not attend a weekly peer support group meeting.[43] Weight loss studies encouraging participants to exercise and change their eating behavior have employed commitment devices,[44] including some that leveraged the involvement of family members or friends of the participant,[45,46] with mixed results.

1.4 Rationale for the IFAST Study

The IF dietary pattern, though not inspired by behavioral economic concepts, is structured to take advantage of them and thus may be particularly amenable to a robust commitment device intervention. Changing one's eating patterns to a complex new diet is a cognitively intense process that requires active consideration of complex information multiple times per day, leading to cognitive overload and impaired decision-making.[47–49] By contrast, IF, especially time-restricted feeding, is cognitively very simple. This simplicity may help participants avoid cognitive overload, initiate the dietary pattern and adhere over the long term.

This study seeks to test how a robust soft commitment device, incorporating both intra- and interpersonal commitments, affects uptake and adherence to an intermittent fasting dietary pattern, as compared with control, in patients with obesity and hypertension

2. Study Objectives

The objectives of this study are the following:

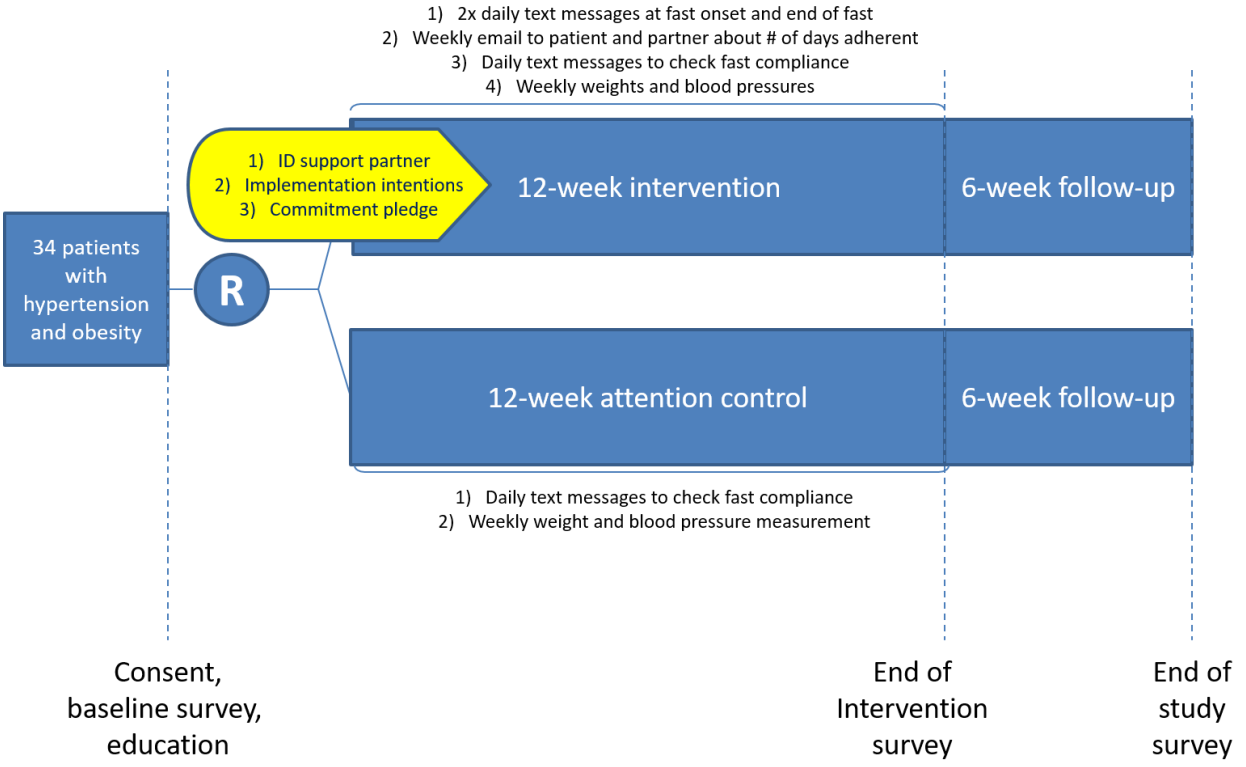
1. To determine the effect of a robust soft commitment device, incorporating both intra- and interpersonal commitments, on uptake and adherence to an intermittent fasting dietary pattern, as compared with control, in patients with hypertension and obesity
2. To determine the effect of the intervention promoting intermittent fasting on blood pressure and weight in patients with hypertension and obesity

3. Study Design

3.1. General Overview

The IFAST study is a two-arm randomized controlled trial aimed at evaluating whether a soft commitment device increases uptake and adherence to an intermittent fasting dietary pattern compared with control in patients with hypertension and obesity. The study will randomize 34 patients with hypertension and obesity to a 12-week intervention employing a commitment pledge, involvement of a supportive partner, setting of implementation intentions, and multiple daily reminder text messages or to an attention control involving daily text messages alone.

Following the intervention, there will be a 6-week follow-up period (see study protocol figure below).



The study will be conducted using Way to Health, a research information technology platform at the University of Pennsylvania used previously for behavioral interventions.

After institutional review board (IRB) approval of the study, patients who meet the eligibility criteria will be approached in select cardiology clinics and invited to participate. Those who qualify and express interest will provide informed consent to the study procedures via the Way to Health platform. All patients will receive a blood pressure cuff and scale, which will be used to measure blood pressure and weight weekly. Within the Way to Health platform, patients will be randomized to the intervention or control arms. All other management decisions are completely at the discretion of the care providers. Data capture will include:

- **Baseline case report form** (for each patient) collecting clinical information abstracted from the medical record
- **Baseline survey** collected via the Way to Health platform including psychometric questions, dietary patterns, and experiences with weight loss and dieting
- **Daily adherence to an intermittent fasting dietary pattern** collected via self-report from text messages
- **Weekly weight and blood pressure measurement** collected via self-report from text messages

3.2. Site
IFAST will enroll patients from cardiology clinics at the Hospital of the University of Pennsylvania and/or via email.

3.3. Patient Selection Criteria
3.3.1. Inclusion Criteria
Patients are eligible to be included in the study if they are ≥ 18 years of age and meet all of the following criteria:

1. Body mass index > 30 kg/m^2
2. Systolic blood pressure > 140 mmHg
3. Owns a smartphone or tablet operating the iOS or Android operating system

3.3.2. Exclusion Criteria
Patients are excluded if they meet any of the following criteria:

1. Unable or unwilling to provide informed consent, including but not limited to cognitive or language barriers (reading or comprehension)
2. Type 1 diabetes
3. Use of insulin or insulin secretagogues (sulfonylureas, metaglinides)
4. Use of medications that require food intake
5. Ongoing use of pharmacologic therapy for weight loss
6. Self-reported eating disorder
7. Other medical condition that could be harmed by intermittent fasting as judged by study physician
8. Anticipated life expectancy less than 6 months
9. Any other reason why it is not feasible to complete the entire 6-month study

4. Study Procedures
4.1. Screening and Informed Consent
Patients with body mass index > 30 kg/m^2 and SBP > 140 mmHg will be identified in select cardiology clinics and invited to participate. Interested participants will be instructed to visit the Way to Health platform online to register. They will also provide a contact number and email address, and will receive a reminder email and a phone call from a study coordinator for assistance with registration.

In addition, a data pull of potentially eligible participants will be performed during the study preparation phase. Once the research team obtains this eligibility list, the order of participants on the list will be randomized and then split into batches of 1000. The initial recruitment list will consist of 500 potentially eligible participants, which will help to ensure all the enrollment mechanisms are in place and working well. Three weeks after the initial recruitment emails/letters are sent, a second batch will be sent. Every 2-3 weeks thereafter, a new batch will be sent out until the randomization target is met. Interested participants will be provided with instructions to visit the Way to Health online platform to register for the study.

On the Way to Health platform, participants will learn more about the study, create an account, provide informed consent, and complete baseline study surveys. Study coordinators will be available to assist patients with this process, as necessary.

We will follow an IRB-approved approach taken by many studies using the Way to Health platform to obtaining informed consent. Upon reaching the portal, potential participants will be asked to create an account and will then be informed of the details of the study, including its objectives, duration, requirements, and financial payments. The Way to Health portal will then take interested participants through an online informed consent. The consent document will be divided into sections and potential participants will have to click a button to advance through each section. This is to help ensure that participants read the consent form thoroughly by breaking down the form into manageable blocks of text. Each section will have a button allowing the user to contact a researcher via email or by telephone if they have questions about the consent form. Successive screens will explain the voluntary nature of the study, the risks and benefits of participation, alternatives to participation, and that participants can withdraw from the study at any time. On the final consent screen, potential participants who click a clearly delineated button stating that they agree to participate in the study will be considered to have consented to enroll. Participants will be provided with details regarding how to contact the research team via email or phone at any time if they subsequently wish to withdraw from the study. This contact information will remain easily accessible via the participants' individual Way to Health web portal dashboards throughout the study.

Support partners will provide verbal informed consent via telephone for their name, email address, and phone number to be stored in the study database.

Once participants have completed the informed consent process, they will be mailed a scale and blood pressure cuff.

4.2. Baseline Questionnaire and Intermittent Fasting Education

After providing informed consent, participants will complete an online questionnaire. The baseline surveys will ask about dietary patterns and experiences with weight loss and dieting. Patients will also complete the Grit Scale and the MOS Social Support survey to obtain a psychometric profile relevant for persistence with a dietary intervention. They will also complete the 2005 Healthy Eating Index scale to assess pre-intervention diet quality.

Following completion of the baseline questionnaire, participants will receive education about intermittent fasting, including its definition, potential health benefits, and expectations about the experience.

4.3. Randomization

Once patients have received their scale and blood pressure cuff, they will be prompted by automated text message from the Way to Health platform to obtain a baseline weight and blood pressure. Once they provide baseline measurements and baseline questionnaires have been completed, they will be randomly assigned via the Way to Health platform to attention control or the soft commitment device using 1:1 allocation. Randomization will be stratified based on BMI ($\leq$ and $>$ 40 kg/m^2) and systolic blood pressure ($\leq$ and $>$ 160 mmHg) and will use blocks of 6 to ensure equal allocation over time.

4.4. Study Arms

4.4.1 Attention control

These patients will be instructed via text message and email to fast at least 16 hours per day every day. For the next 16 weeks, they will receive a daily text message via the Way to Health

platform asking if they fasted for at least 16 hours over the past 24 hours. If they fail to respond, reminder text messages will be sent. Once per week, they will receive a text message asking them to weigh themselves and check their blood pressure, and reply with the results via text message

4.4.1. Soft commitment device

Patients randomized to the commitment device arm will be asked to visit the Way to Health platform. There, they will identify a support person, a family or friend who they speak to frequently and who is invested in their health. They will then complete a series of questions intended to create implementation intentions. Specifically, they will pick a time for their fast to begin each 24-hour period and a time for their fast to end. They will also develop strategies to deal with hunger arising during a fast period. After this process, they will sign a contract pledging to adhere to the 16:8 time-restricted feeding dietary pattern, and acknowledging that their support person will receive a copy of the contract and weekly updates about their adherence to the regimen.

For the next 12 weeks, participants in this arm will receive reminder text messages two times daily via Way to Health: Once at the start of their fast period and once during the meal that they skip during the fast period. Each week, participants and their support partner will also receive a text message noting how many days in the previous week they successfully fasted for at least 16 hours. After the 12 week intervention, these text messages will stop, but for the entire 18-week period, participants in this arm will receive the same text messages as the attention control arm: A daily text message asking if they fasted for at least 16 hours over the previous 24 hours, and a weekly text message asking for weight and blood pressure results.

4.5. End-of-Study Questionnaire Completion

At the end of the 16-week study period, patients will be alerted by the Way to Health platform to return to the website to complete an end-of-study questionnaire regarding their experience with IF.

5. Statistical Methods

5.1 Primary and secondary outcome measures

The study's primary outcome measure is adherence to the IF regimen, captured via daily text message, over 18 weeks, expressed in days per week.

Secondary outcome measures will include:

1) Adherence to the IF regimen over 12 weeks
2) Change in systolic blood pressure from baseline to 12 weeks and 18 weeks
3) Change in weight from baseline to 12 weeks and 18 weeks

Exploratory analyses will compare change in blood pressure and weight in patients that were adherent to IF ≥ 4 days per week vs. < 4 days per week

5.2. Sample Size

With 34 patients (17 per arm), we will have 90% power to detect a 1 day per week difference in adherence to IF, assuming a standard deviation in days fasted per week < 1.[24] The study will

have ~ 50% power to detect a 10 mmHg change in systolic and diastolic blood pressure (assuming a standard deviation of 15 mmHg) and a 3 kg weight loss (assuming a standard deviation of 5 kg).

5.3. Data Analyses

Data for all patients who received at least 1 text message asking if they fasted the day prior, whether or not they completed all protocol requirements, will be included for analysis. Patient demographics, risk profiles, clinical characteristics, and baseline questionnaire results will be reported. All analyses will be performed using a modified intention-to-treat, excluding only patients who did not receive at least 1 text message asking if they fasted the day prior. Data can be missing for any day if the participant did not report adherence with daily fasting. For the main analysis, we will assume that days for which patients did not report adherence with daily fasting were non-adherent days. The primary analysis will compare days fasted per week between attention control and commitment device arms using a t test. Secondary analyses compare change from baseline in blood pressure and weight between arms using mixed effects regression models. Exploratory analyses will compare change from baseline in blood pressure and weight in patients who reported fasting ≥ 4 days/week versus those who reported fasting < 4 days/week using mixed effects regression models.

6. Human Research Protection

6.1 Data confidentiality

Paper-based records will be kept in a secure location and only be accessible to personnel involved in the study. Computer-based files will only be made available to personnel involved in the study through the use of access privileges and passwords. Wherever feasible, identifiers will be removed from study-related information. Precautions are in place to ensure the data are secure by using passwords and encryption, because the research involves web-based surveys.

6.2 Subject confidentiality

Research material will be obtained from participant surveys and wearable devices. All participants will provide informed consent for access to these materials. The data to be collected include data on participant characteristics and behaviors, daily adherence to an IF dietary pattern, and weekly weight and blood pressure measurements. Research material that is obtained will be used for research purposes only. The same procedure used for the analysis of automated data sources to ensure protection of patient information will be used for the survey data, in that patient identifiers will be used only for linkage purposes or to contact patients. The study identification number, and not other identifying information, will be used on all data collection instruments. All study staff will be reminded to appreciate the confidential nature of the data collected and contained in these databases. The Penn Medicine Academic Computing Services (PMACS) will be the hub for the hardware and database infrastructure that will support the project and is where the Way to Health web portal is based. The PMACS is a joint effort of the University of Pennsylvania's Abramson Cancer Center, the Cardiovascular Institute, the Department of Pathology, and the Leonard Davis Institute. The PMACS provides a secure computing environment for a large volume of highly sensitive data, including clinical, genetic, socioeconomic, and financial information. Among the IT projects currently managed by PMACS are: (1) the capture and organization of complex, longitudinal clinical data via web and clinical

applications portals from cancer patients enrolled in clinical trials; (2) the integration of genetic array databases and clinical data obtained from patients with cardiovascular disease; (3) computational biology and cytometry database management and analyses; (4) economic and health policy research using Medicare claims from over 40 million Medicare beneficiaries. PMACS requires all users of data or applications on PMACS servers to complete a PMACS-hosted cybersecurity awareness course annually, which stresses federal data security policies under data use agreements with the university. The curriculum includes Health Insurance Portability and Accountability Act (HIPAA) training and covers secure data transfer, passwords, computer security habits and knowledge of what constitutes misuse or inappropriate use of the server. We will implement multiple, redundant protective measures to guarantee the privacy and security of the participant data. All investigators and research staff with direct access to the identifiable data will be required to undergo annual responsible conduct of research, cybersecurity, and HIPAA certification in accordance with University of Pennsylvania 334 regulations. Data will be stored, managed, and analyzed on a secure, encrypted server behind the University of Pennsylvania Health System (UPHS) firewall. This server was created for projects conducted by the Penn Medicine Nudge Unit related to physician and patient behavior at UPHS. All study personnel that will use this data are listed on the IRB application and have completed training in HIPAA standards and the CITI human subjects research. Data access will be password protected. Whenever possible, data will be deidentified for analysis.

6.3 Subject privacy

Interested participants will be directed to the Way to Health portal where they will be asked to enter data related to eligibility and their demographic characteristics. Enrollment will include a description of the voluntary nature of participation, the study procedures, risks and potential benefits in detail. The enrollment procedure will provide the opportunity for potential participants to ask questions and review the consent form information prior to making a decision to participate. Participants will be told that they do not have to answer any questions if they do not wish and can drop out of the study at any time, without affecting their medical care or the cost of their care. They will be told that they may or may not benefit directly from the study and that all information will be kept strictly confidential, except as required by law. Subjects will have access to a copy of the consent document. All efforts will be made by study staff to ensure subject privacy.

6.4 Data disclosure

The following entities, besides the members of the research team, may receive protected health information (PHI) for this research study: Twilio, Inc., the company which processes some 359 study-related messages. Twilio will store patients' phone numbers on their secure computers. Qualtrics, Inc., the company which processes most study-related surveys. Qualtrics will house de-identified answers to these surveys on their secure servers. The Office of Human Research Protections at the University of Pennsylvania -Federal and state agencies (for example, the Department of Health and Human Services, the National Institutes of Health, and/or the Office 364 for Human Research Protections), or other domestic or foreign government bodies if required by 365 law and/or necessary for oversight purposes.

6.5 Data safety and monitoring

The Principal Investigator will be responsible for monitoring the study. All participants will be given anticipatory guidance on when to seek medical attention. In addition, participants will be asked to report to the study team any injuries or medical care that they feel resulted from participation in the study. They can either call the study team or send an email. The research coordinator will call the participant to collect information regarding the issue and then the PI will review and determine whether it is ok to proceed, further investigation is needed, or the participant should stop the study. For this study there will be no stopping rules or endpoints and thus no planned interim analyses.

6.6 Risk/benefit

6.6.1 Potential study risks

Both arms will be instructed to pursue an IF dietary pattern, which has been shown to be generally safe across multiple studies. Potential adverse effects of IF include irritability, hunger, difficulty with concentration, development of an eating disorder, disrupted sleep, dehydration and dizziness, and feelings of guilt and increased stress. There is a theoretical risk of hypoglycemia and pancreatitis. At the start of the study, patients will be given information on risks of IF and guidance on when to seek medical attention. They will also be encouraged to consume plenty of fluids during their daily fasting period. Patients on insulin or insulin secretagogues will be excluded from participation, limiting the risk of iatrogenic hypoglycemia, but patients with diabetes mellitus will be asked about episodes of hypoglycemia via weekly text messages, and all patients will be asked about hospitalizations and emergency room visits via weekly text messages.

Another potential risk of this study is a breach of participant confidentiality. We will minimize this risk by using secure data methods as described previously. Names and addresses will be stored in encrypted databases. These data will be viewable only by the respective participants, the study coordinator(s) and the project manager(s). All other members of the research team will be able to view only participant ID numbers. Even the study arms will be identified by code letters until both the statistician and PI agree that analysis is complete.

6.6.2 Potential study benefits

Through participation in this study, each participant will have the potential to engage in an IF dietary pattern. In small studies, IF has been associated with weight loss and improvement in cardiometabolic parameters, including blood pressure and lipids. If this approach to encouraging IF is effective, it could have tremendous benefits for society if adopted on a wide scale to help individuals. It is expected that other people will gain knowledge from this study and that participation could help understand how to effectively motivate individuals to change behavior. Participants may also receive no benefit from their participation in the study.

6.6.3 Risk/benefit assessment

Anticipated risks of this study should be minimal and the risk/benefit ratio is very favorable. To minimize the chance for serious and unexpected adverse events, study participants will be screened through exclusion criteria for any health conditions that may be exacerbated by participating in this study. We have previously outlined the procedures that will be used to prevent a breach of participant data.

7. References

1. Benjamin EJ, Virani SS, Callaway CW, Chang AR, Cheng S, Chiuve SE, Cushman M, Delling FN, Deo R, de Ferranti SD, Ferguson JF, Fornage M, Gillespie C, Isasi CR, Jimenez MC, Jordan LC, Judd SE, Lackland D, Lichtman JH, Lisabeth L, Liu S, Longenecker CT, Lutsey PL, Matchar DB, Matsushita K, Mussolino ME, Nasir K, O'Flaherty M, Palaniappan LP, Pandey DK, Reeves MJ, Ritchey MD, Rodriguez CJ, Roth GA, Rosamond WD, Sampson UKA, Satou GM, Shah SH, Spartano NL, Tirschwell DL, Tsao CW, Voeks JH, Willey JZ, Wilkins JT, Wu JH, Alger HM, Wong SS, Muntner P. Heart Disease and Stroke Statistics-2018 Update: A Report From the American Heart Association. *Circulation*. 2018;
2. A Randomized Trial of Intensive versus Standard Blood-Pressure Control. *N Engl J Med*. 2015;373:2103–2116.
3. Neal B, MacMahon S, Chapman N, Blood Pressure Lowering Treatment Trialists' Collaboration. Effects of ACE inhibitors, calcium antagonists, and other blood-pressure-lowering drugs: results of prospectively designed overviews of randomised trials. Blood Pressure Lowering Treatment Trialists' Collaboration. *Lancet*. 2000;356:1955–1964.
4. McManus RJ, Mant J, Bray EP, Holder R, Jones MI, Greenfield S, Kaambwa B, Banting M, Bryan S, Little P, Williams B, Hobbs FDR. Telemonitoring and self-management in the control of hypertension (TASMINH2): a randomised controlled trial. *Lancet*. 2010;376:163–172.
5. Bosworth HB, Powers BJ, Olsen MK, McCant F, Grubber J, Smith V, Gentry PW, Rose C, Van Houtven C, Wang V, Goldstein MK, Oddone EZ. Home blood pressure management and improved blood pressure control: results from a randomized controlled trial. *Arch Intern Med*. 2011;171:1173–1180.
6. Ho PM, Lambert-Kerzner A, Carey EP, Fahdi IE, Bryson CL, Melnyk SD, Bosworth HB, Radcliff T, Davis R, Mun H, Weaver J, Barnett C, Baron A, Del Giacco EJ. Multifaceted intervention to improve medication adherence and secondary prevention measures after acute coronary syndrome hospital discharge: a randomized clinical trial. *JAMA Intern Med*. 2014;174:186–93.
7. Green BB, Cook AJ, Ralston JD, Fishman PA, Catz SL, Carlson J, Carrell D, Tyll L, Larson EB, Thompson RS. Effectiveness of home blood pressure monitoring, Web communication, and pharmacist care on hypertension control: a randomized controlled trial. *JAMA*. 2008;299:2857–2867.
8. Magid DJ, Olson KL, Billups SJ, Wagner NM, Lyons EE, Kroner BA. A pharmacist-led, American Heart Association Heart360 Web-enabled home blood pressure monitoring program. *Circ Cardiovasc Qual Outcomes*. 2013;6:157–163.
9. Artinian NT, Flack JM, Nordstrom CK, Hockman EM, Washington OGM, Jen K-LC, Fathy M. Effects of nurse-managed telemonitoring on blood pressure at 12-month follow-up among urban African Americans. *Nurs Res*. 2007;56:312–322.
10. Magid DJ, Ho PM, Olson KL, Brand DW, Welch LK, Snow KE, Lambert-Kerzner AC, Plomondon ME, Havranek EP. A multimodal blood pressure control intervention in 3 healthcare systems. *Am J Manag Care*. 2011;17:e96-103.
11. Reed SD, Li Y, Oddone EZ, Neary AM, Orr MM, Grubber JM, Graham FL, Olsen MK, Svetkey LP, Dolor RJ, Powers BJ, Adams MB, Bosworth HB. Economic evaluation of home blood pressure monitoring with or without telephonic behavioral self-management in patients with hypertension. *Am J Hypertens*. 2010;23:142–148.

12. Margolis KL, Asche SE, Dehmer SP, Bergdall AR, Green BB, Sperl-Hillen JM, Nyboer RA, Pawloski PA, Maciosek MV, Trower NK, O'Connor PJ. Long-term Outcomes of the Effects of Home Blood Pressure Telemonitoring and Pharmacist Management on Blood Pressure Among Adults With Uncontrolled Hypertension: Follow-up of a Cluster Randomized Clinical Trial. *JAMA Netw Open*. 2018;1:e181617–e181617.
13. Maciejewski ML, Bosworth HB, Olsen MK, Smith VA, Edelman D, Powers BJ, Kaufman MA, Oddone EZ, Jackson GL. Do the benefits of participation in a hypertension self-management trial persist after patients resume usual care? *Circ Cardiovasc Qual Outcomes*. 2014;7:269–275.
14. Whelton PK, Carey RM, Aronow WS, Casey DE, Collins KJ, Dennison Himmelfarb C, DePalma SM, Gidding S, Jamerson KA, Jones DW, MacLaughlin EJ, Muntner P, Ovbiagele B, Smith SC, Spencer CC, Stafford RS, Taler SJ, Thomas RJ, Williams KA, Williamson JD, Wright JT. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*. 2018;71:e127–e248.
15. Williams B, Mancia G, Spiering W, Agabiti Rosei E, Azizi M, Burnier M, Clement DL, Coca A, de Simone G, Dominiczak A, Kahan T, Mahfoud F, Redon J, Ruilope L, Zanchetti A, Kerins M, Kjeldsen SE, Kreutz R, Laurent S, Lip GYH, McManus R, Narkiewicz K, Ruschitzka F, Schmieder RE, Shlyakhto E, Tsioufis C, Aboyans V, Desormais I, Group ESCSD. 2018 ESC/ESH Guidelines for the management of arterial hypertension. *Eur Heart J*. 2018;39:3021–3104.
16. Tyson CC, Davenport CA, Lin P-H, Scialla JJ, Hall R, Diamantidis CJ, Lunyera J, Bhavsar N, Rebholz CM, Pendergast J, Boulware LE, Svetkey LP. DASH Diet and Blood Pressure Among Black Americans With and Without CKD: The Jackson Heart Study. *Am J Hypertens*. 2019;32:975–982.
17. Kim H, Andrade FCD. Diagnostic status of hypertension on the adherence to the Dietary Approaches to Stop Hypertension (DASH) diet. *Prev Med Rep*. 2016;4:525–531.
18. Appel LJ, Moore TJ, Obarzanek E, Vollmer WM, Svetkey LP, Sacks FM, Bray GA, Vogt TM, Cutler JA, Windhauser MM, Lin PH, Karanja N. A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. *N Engl J Med*. 1997;336:1117–1124.
19. Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, Harsha D, Obarzanek E, Conlin PR, Miller ER, Simons-Morton DG, Karanja N, Lin PH, DASH-Sodium Collaborative Research Group. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. *N Engl J Med*. 2001;344:3–10.
20. Appel LJ, Champagne CM, Harsha DW, Cooper LS, Obarzanek E, Elmer PJ, Stevens VJ, Vollmer WM, Lin P-H, Svetkey LP, Stedman SW, Young DR, Writing Group of the PREMIER Collaborative Research Group. Effects of comprehensive lifestyle modification on blood pressure control: main results of the PREMIER clinical trial. *JAMA*. 2003;289:2083–2093.
21. Elmer PJ, Obarzanek E, Vollmer WM, Simons-Morton D, Stevens VJ, Young DR, Lin P-H, Champagne C, Harsha DW, Svetkey LP, Ard J, Brantley PJ, Proschan MA, Erlinger TP, Appel LJ, PREMIER Collaborative Research Group. Effects of comprehensive lifestyle

modification on diet, weight, physical fitness, and blood pressure control: 18-month results of a randomized trial. *Ann Intern Med*. 2006;144:485–495.
22. de Cabo R, Mattson MP. Effects of Intermittent Fasting on Health, Aging, and Disease. *N Engl J Med*. 2019;381:2541–2551.
23. Malinowski B, Zalewska K, Węsierska A, Sokołowska MM, Socha M, Liczner G, Pawlak-Osińska K, Wiciński M. Intermittent Fasting in Cardiovascular Disorders—An Overview. *Nutrients*. 2019;11:pii: E673.
24. Gabel K, Hoddy KK, Haggerty N, Song J, Kroeger CM, Trepanowski JF, Panda S, Varady KA. Effects of 8-hour time restricted feeding on body weight and metabolic disease risk factors in obese adults: A pilot study. *Nutr Healthy Aging*. 2018;4:345–353.
25. Wilhelmi de Toledo F, Grundler F, Bergouignan A, Drinda S, Michalsen A. Safety, health improvement and well-being during a 4 to 21-day fasting period in an observational study including 1422 subjects. *PLoS One*. 2019;14:e0209353.
26. Eshghinia S, Mohammadzadeh F. The effects of modified alternate-day fasting diet on weight loss and CAD risk factors in overweight and obese women. *J Diabetes Metab Disord*. 2013;12:4.
27. Erdem Y, Özkan G, Ulusoy Ş, Arıcı M, Derici Ü, Şengül Ş, Sindel Ş, Ertürk Ş. The effect of intermittent fasting on blood pressure variability in patients with newly diagnosed hypertension or prehypertension. *J Am Soc Hypertens*. 2018;12:42–49.
28. Sutton EF, Beyl R, Early KS, Cefalu WT, Ravussin E, Peterson CM. Early Time-Restricted Feeding Improves Insulin Sensitivity, Blood Pressure, and Oxidative Stress Even without Weight Loss in Men with Prediabetes. *Cell Metab*. 2018;27:1212-1221.e3.
29. Wilkinson MJ, Manoogian ENC, Zadourian A, Lo H, Fakhouri S, Shoghi A, Wang X, Fleischer JG, Navlakha S, Panda S, Taub PR. Ten-Hour Time-Restricted Eating Reduces Weight, Blood Pressure, and Atherogenic Lipids in Patients with Metabolic Syndrome. *Cell Metab*. 2020;31:92-104.e5.
30. Barnosky AR, Hoddy KK, Unterman TG, Varady KA. Intermittent fasting vs daily calorie restriction for type 2 diabetes prevention: a review of human findings. *Transl Res*. 2014;164:302–311.
31. Thaler RH, Shefrin HM. An Economic Theory of Self-Control. *J Polit Econ*. 1981;89:392–406.
32. Bryan G, Karlan D, Nelson S. Commitment Devices. *Ann Rev Econ*. 2010;2:671–698.
33. Rogers T, Milkman KL, Volpp KG. Commitment devices: using initiatives to change behavior. *JAMA*. 2014;311:2065–2066.
34. Giné X, Karlan D, Zinman J. Put Your Money Where Your Butt Is: A Commitment Contract for Smoking Cessation. *Am Econ J Appl Econ*. 2010;2:213–235.
35. Schweiger Gallo I, Gollwitzer PM. Implementation intentions: a look back at fifteen years of progress. *Psicothema*. 2007;19:37–42.
36. Armitage CJ. Efficacy of a brief worksite intervention to reduce smoking: the roles of behavioral and implementation intentions. *J Occup Health Psychol*. 2007;12:376–390.
37. Leventhal H, Singer R, Jones S. EFFECTS OF FEAR AND SPECIFICITY OF RECOMMENDATION UPON ATTITUDES AND BEHAVIOR. *J Pers Soc Psychol*. 1965;2:20–29.
38. Asch DA, Rosin R. Engineering Social Incentives for Health. *N Engl J Med*. 2016;375:2511–2513.

39. Patel MS, Small DS, Harrison JD, Fortunato MP, Oon AL, Rareshide CAL, Reh G, Szwartz G, Guszcza J, Steier D, Kalra P, Hilbert V. Effectiveness of Behaviorally Designed Gamification Interventions With Social Incentives for Increasing Physical Activity Among Overweight and Obese Adults Across the United States: The STEP UP Randomized Clinical Trial. *JAMA Intern Med*. 2019;1–9.
40. Long JA, Jahnle EC, Richardson DM, Loewenstein G, Volpp KG. Peer mentoring and financial incentives to improve glucose control in African American veterans: a randomized trial. *Ann Intern Med*. 2012;156:416–424.
41. Patel MS, Asch DA, Rosin R, Small DS, Bellamy SL, Eberbach K, Walters KJ, Haff N, Lee SM, Wesby L, Hoffer K, Shuttleworth D, Taylor DH, Hilbert V, Zhu J, Yang L, Wang X, Volpp KG. Individual Versus Team-Based Financial Incentives to Increase Physical Activity: A Randomized, Controlled Trial. *J Gen Intern Med*. 2016;31:746–754.
42. Wing RR, Jeffery RW. Benefits of recruiting participants with friends and increasing social support for weight loss and maintenance. *J Consult Clin Psychol*. 1999;67:132–138.
43. Kast F, Meier S, Pomeranz D. Under-Savers Anonymous: Evidence on Self-Help Groups and Peer Pressure as a Savings Commitment Device [Internet]. National Bureau of Economic Research; 2012 [cited 2020 Feb 13]. Available from: http://www.nber.org/papers/w18417
44. Coupe N, Peters S, Rhodes S, Cotterill S. The effect of commitment-making on weight loss and behaviour change in adults with obesity/overweight; a systematic review. *BMC Public Health*. 2019;19:816.
45. Black DR, Lantz CE. Spouse involvement and a possible long-term follow-up trap in weight loss. *Behav Res Ther*. 1984;22:557–562.
46. Ureda JR. The Effect of Contract Witnessing on Motivation and Weight Loss in a Weight Control Program: *Health Educ Q*. 1980;7:163–185.
47. Chapman LE, Sadeghzadeh C, Koutlas M, Zimmer C, Marco MD. Evaluation of three behavioural economics 'nudges' on grocery and convenience store sales of promoted nutritious foods. *Public Health Nutr*. 2019;22:3250–3260.
48. Sweller J. Cognitive load during problem solving: Effects on learning. *Cogn Sci*. 1988;12:257–285.
49. Richards MR, Sindelar JL. Rewarding Healthy Food Choices in SNAP: Behavioral Economic Applications. *Milbank Q*. 2013;91:395–412.