BACKGROUND: Mobile health (mHealth) has emerged rapidly as a multibillion dollar industry with tens of thousands of consumer smartphone health applications (apps) available, most of which have not been subject to scientific study or regulatory approval. The potential for mHealth tools to represent an important advancement in chronic disease care (i.e., via education about chronic illness, appointment reminders, monitoring disease control, facilitating behavior change) has been recognized. Although primary care is the setting where most chronic disease care occurs, the patterns of mHealth use among primary care patients have not been documented. This study aimed to determine the prevalence of mHealth use among primary care patients and examine demographic and clinical correlates.

METHODS: All adult patients who presented to one of 6 primary care clinics located in 4 states (Washington, Wyoming, Alaska, Montana) in a practice-based research network during a 2-week period received an anonymous survey that assessed mobile phone ownership, mHealth use including frequency and characteristics of use, sociodemographic characteristics (age, gender, race/ethnicity, health literacy), chronic medical conditions, and current depressive symptoms (PHQ-2). Data analysis employed descriptive statistics and multivariate mixed logistic regression.

RESULTS: 918 patients responded to the survey (estimated response rate: 67.4%). Mobile phone ownership was nearly ubiquitous (91%), with the majority of patients (55%) owning a smartphone. Mobile health use was common (70% of smartphone owners; 39% of all patients). Most mHealth users were seeking health information (92%) and many were using mHealth applications (57%) or tracking a health condition (54%). Compared to young adults (ages 18-24), smartphone ownership and mHealth use were each less common among adults in every age group over 45 years (adjusted ORs 0.07-0.39, ps<=0.001). Health literacy, chronic medical conditions, and depression were not associated with mHealth use. Most mHealth users were infrequent users and most (61%) reported using an app for a short period of time then stopping, often (48%) because it was too time-consuming. The most popular types of apps were general health apps (36%) followed by fitness (15%) and diet (10%) apps, with very few patients (3%) using apps for chronic disease management. Fewer than 10% of mHealth users learned about mHealth apps from their healthcare provider, with 69% reporting that it was ‘not at all’ or only ‘a little bit’ important for their providers to know about their use of health apps. However, patients rated appointment reminders as the most useful potential feature, followed closely by medication reminders, general health information, and health tracking.

CONCLUSIONS: Smartphone ownership and mHealth use are common among primary care patients. Adoption lags among older adults, however patients with limited health literacy and chronic conditions use mHealth technologies at similar rates as their counterparts, supporting the potential role of mHealth in improving disease management among certain groups in need. Few patients believe it is important for healthcare providers to know about their mHealth use; however, providers who do discuss mHealth use with patients may be able to elicit important information about patients' self-management activities, which may help these providers to be more adept in the support they offer for chronic disease care.
BACKGROUND: More than one third of US adults are obese. The USPSTF recommends that primary care providers (PCPs) screen for obesity and offer or refer obese patients to intensive, multicomponent behavioral interventions; however, such treatment is rarely accessible in the primary care setting. Online counseling can provide convenient behavioral support in the setting in which lifestyle choices are made. Our prior work has shown that primary care patients find it to be a satisfactory approach for delivering intensive behavioral interventions.

METHODS: We facilitated the delivery of preventive counseling by using information technology to translate an evidence-based intensive lifestyle intervention into diverse primary care settings, and conducted a randomized controlled trial comparing the effectiveness of three online approaches for integrating behavioral lifestyle treatment with primary care medicine. Obese primary care patients were referred by their PCPs for an online weight loss intervention and randomized into 1 of 3 arms. Each participant received an in-person lifestyle counseling session plus one year of access to either (1) comprehensive online intervention with standard coaching (COI-S), (2) comprehensive online intervention with modulated coaching (COI-M) or (3) online goals and resources (OGR) alone. Both COI interventions included online lessons adapted from the proven Diabetes Prevention Program's lifestyle intervention, interactive workbook exercises, asynchronously delivered advice and support from a lifestyle coach, self-monitoring tools with automated feedback, and links to reputable community resources. For COI-M participants, coaches had an electronic tool that helped identify patients in need of counseling, and modulated their counseling intensity to reflect participant need (i.e., no notes were sent unless a potential concern was identified). We measured weight change and used electronic surveys to assess covariates and potential confounders at baseline, 6 months and 12 months. Fisher exact and Chi-square tests were used for our comparisons.

RESULTS: 373 obese patients were recruited from 6 primary care practices in western Pennsylvania from April to December, 2010. On average participants were age 49.4 (SD 12.6), and weighed 106.1 kg (SD 20.7). Of the sample, 76% were female and 20% were African American. All study arms lost weight at 6 months, with the largest estimated difference seen in the COI-M group [-3.36, 95% confidence interval (CI): -4.70,-2.02], the smallest estimated difference seen in the OGR arm [-1.91 (CI: -2.89,-0.94)] and an intermediate estimated difference seen for the COI-S arm [-2.44 (CI: -3.39,-1.48)]. Weight loss was sustained at 12 months in each study arm, with point estimates for weight further declining in the COI-M and OGR arms over the second half of the interventions (see Figure). At each time point, there was no significant difference in weight loss between groups. Survey data indicated that the use of non-study resources for weight loss differed by study arm at 6 months of enrollment with more OGR participants using such resources than did COI-M or COI-S participants (14.4%, 6.3%, and 3.4%, respectively; p=0.015).

CONCLUSIONS: All three interventions led to weight loss over 1 year of follow-up and weight regain was not seen in any group. While we found no statistically significant difference in the estimated differences between the three groups, the estimated weight change in each group suggests that the intensive intervention with as-needed coaching had the most clinically relevant results. The greater weight loss in the OGR (active control) group than anticipated from the literature may reflect a larger use of participants' personal resources for lifestyle management. These findings suggest that online lifestyle support can be implemented in coordination with primary care medicine.
PREDICTORS OF ENGAGEMENT IN AN INTERNET SUPPORT GROUP FOR TREATING MOOD AND ANXIETY DISORDERS IN PRIMARY CARE
Emily Rosenberger1; Kaleab Abebe2,1; Bea Herbeck Belnap2; Jordan F. Karp3,1; Bruce L. Rollman2,1.
1University of Pittsburgh, Pittsburgh, PA; 2University of Pittsburgh, Pittsburgh, PA; 3University of Pittsburgh, Pittsburgh, PA. (Tracking ID #1937516)

BACKGROUND: Internet support groups (ISGs) that enable individuals with similar conditions to exchange information and support are emerging as an important self-help resource. Evidence suggests that ISG participants may experience less psychological distress, be more confident in their knowledge about their health and feel less socially isolated. Building an engaged ISG community is believed to be critical for an ISG's success, yet little is known about patient characteristics that predict engagement in an ISG for a mental health condition. We examined this issue using data collected as part of an ongoing NIMH-funded trial of online collaborative care for treating mood and anxiety disorders in primary care.

METHODS: Primary care providers from 26 Pittsburgh-area practices referred their depressed and anxious patients aged 18-75 to our trial in response to an electronic medical record system prompt generated during the office encounter. Protocol-eligible patients with Internet access who scored PHQ-9 and/or GAD-7 ≥10 were randomized to one of three groups, including one permitting access to our password-protected ISG. The ISG consists of: (1) moderated discussion boards where patients can pose questions and share treatment information and experiences; (2) links to reliable consumer health information, crisis hotlines, ask-an-expert, pharmacies and other resources; and (3) access to a proven-effective computerized cognitive behavioral therapy program. Patients were encouraged to login and participate via weekly email reminders and updates, quarterly contests to promote ISG discussions and the potential to earn status indicators for participating on discussion boards. We collected baseline data on mood (PHQ-9) and anxiety (GAD-7) symptoms, Internet use and sociodemographics, and we analyzed ISG server logs to measure user logins and creation of new discussion board posts and comments. We investigated predictors of ISG engagement, defined by a new post or comment, using zero-inflated Poisson regression to account for the sizeable proportion of patients who never engaged with the ISG.

RESULTS: Between 8/1/12-9/30/13, we randomized 175 patients to have ISG access. Their mean age was 43 (SD: 14), 82% were female, 84% were white, and their mean PHQ-9 and GAD-7 were 14.0 (4.7) and 12.7 (4.6), respectively. Overall, 77% logged-in at least once (median: 5, range: 0-76) and 47% made at least 1 post or comment. Those with higher levels of ISG engagement were more educated (RR >high school vs. ≤high school, 5.55, 95% CI: 4.15-7.43; p<0.001); had received prior treatment for anxiety or depression (1.72, 1.24-2.38; p=0.001) including pharmacotherapy (2.75, 1.84-4.11; p<0.001); lacked social anxiety (4.94, 3.91-6.23; p<0.001) or PTSD (3.15, 2.05-4.83; p<0.001); and acknowledged having searched online about alternative medical treatments (1.30, 1.09-1.55; p=0.003). Furthermore, whereas higher levels of mood symptoms were associated with decreased engagement (RR each 5-point increase in PHQ-9 score, 0.56, 0.51-0.62; p<0.001), higher levels of anxiety symptoms were associated with increased engagement (RR each 5-point increase in GAD-7 score, 1.34, 1.20-1.49; p<0.001).

CONCLUSIONS: Certain characteristics can identify depressed and anxious primary care patients who are more likely to engage with an ISG. Our trial is ongoing and will inform whether patient access to an ISG provided as part of a collaborative care intervention improves treatment outcomes.
WHEN LESS IS MORE: RESULTS OF A RANDOMIZED CONTROLLED TRIAL ON ASSISTING AND ARRANGING SOCIAL NETWORKS FOR WALKING IN SEDENTARY ADULTS

Liza Rovniak; Jennifer Kraschnewski; Christopher Sciamanna; Ding Ding; Melissa Bopp; Daniel George; James Sallis; Melbourne F. Hovell. 1 Penn State College of Medicine, Hershey, PA; 2 Penn State-Hershey Medical Center, Hershey, PA; 3 University of Sydney, Sydney, NSW, Australia; 4 Pennsylvania State University, State College, PA; 5 Pennsylvania State University, Hershey, PA; 6 University of California, San Diego, San Diego, CA; 7 San Diego State University, San Diego, CA. (Tracking ID #1938319)

BACKGROUND: Epidemiological research suggests that social networks are critical for adopting and sustaining regular physical activity (PA). However, little is known about how best to "engineer" online or in-person social networks to increase PA among sedentary adults. The 5A Model of Behavior Change predicts that "arranging" social networks for PA would be more effective than simply "assisting" participants to build social networks for PA. However, no study to our knowledge has tested this hypothesis.

METHODS: We randomly assigned 308 sedentary adults to three groups: (1) Arranging Networks: weekly feedback on online and in-person social network interactions for walking, and access to an online social networking site for PA, plus 12-week evidence-based walking program and weekly social networking tips for PA; (2) Assisting Networks—High Dose: 12-week evidence-based walking program and weekly social networking tips only; (3) Assisting Networks—Low Dose: weekly social networking tips only. Ongoing process evaluations were conducted to ensure treatment fidelity. In-person assessments were conducted at baseline, post-program, and 6-month follow-up. Differences between groups were analyzed using ANCOVA, adjusted for demographics and baseline scores.

RESULTS: At baseline, participants were 61.6% female, 83.4% overweight/obese, and 8.1% non-White, with a mean age of 50.3 years; 87% and 83%, respectively, completed the post-program and 6-month assessments. The Assisting Networks-Low Dose group demonstrated a greater increase in accelerometer-measured light/lifestyle PA from baseline to 6-months (14.1 mins/day), relative to the Assisting Networks-High Dose (-9.2 mins/day) and Arranging Networks (-3.0 mins/day) groups (p<.05). There were no significant between-group differences at post-program or 6-months in accelerometer-measured moderate/vigorous PA or in objectively-measured aerobic fitness, body mass index (BMI), and waist circumference. Within-group analyses indicated that all groups either maintained, or significantly improved, their accelerometer-measured moderate/vigorous PA, BMI, and waist circumference from baseline to 6-months. Qualitative analyses indicated that many of the study's middle-aged participants lacked interest in visiting online social networking sites for PA. Many participants reported that it was easier to walk alone than to schedule walks with others.

CONCLUSIONS: Unexpectedly, "assisting" sedentary adults to build social networks for PA with weekly tips yielded slightly better objectively-measured outcomes than "arranging" social networks with online networking sites and weekly follow-up. These findings suggest that more needs to be learned about the best strategies for engineering social networks for PA. Future research should explore if study findings replicate among more diverse populations, and how to further improve outcomes. The low-dose, cost-effective intervention to "assist" social networks for PA could easily be replicated and disseminated as part of automated physician-delivered PA interventions.
EHR USABILITY BURDEN AND ITS IMPACT ON PRIMARY CARE PROVIDERS WORKFLOW
Zia Agha¹²; Alan Calvitti³; Shazia Ashfaq³; Neil J. Farber²; Richard L. Street⁴; Kristin Bell¹; Lin Liu¹; Mark Gabuzda¹; Yunan Chen⁵; Barbara Gray³; Steven Rick³.¹VA San Diego Healthcare System, San Diego, CA; ²Univ. of California San Diego, San Diego, CA; ³Veterans Medical Research Foundation San Diego, San Diego, CA; ⁴Texas A&M, College Station, TX; ⁵Univ. of California Irvine, Irvine, CA. (Tracking ID #1940994)

BACKGROUND: Electronic Health Records (EHRs) often integrate poorly with clinical workflow and suffer from poor usability. In this paper, we describe how primary care clinicians' EHR use patterns relate to usability and how these patterns suggest multiple inefficiencies and burdensome workflow for primary care providers.

METHODS: This time-motion study is based on video and EHR activity capture. We observed 21 clinicians and 111 established patients during primary care office visits at 4 Veterans Administration (VA) clinics. Data were coded for specific EHR tasks and clinical workflow. Hierarchical and sequential analysis of EHR clickstream and clinical workflow were integrated to provide objective baseline use patterns.

RESULTS: The 111 outpatient follow-up visits (~60 hours of observation) were analyzed in terms of time-at-task in clinical workflow (Figure 1A). Clinicians spent 42% of visit time with EHR tasks compared to 35% with patients. We observed a median 158 mouse clicks per visit and for every 100 mouse clicks (Fig 1B), visit duration increases by 6 minutes (95% CI = 0.05-0.07, p<0.0001). Clinicians frequently multitask when using EHRs and navigate across multiple functions (median 19 times per visit). Notes (40%) and Orders (27%) were the most frequently used functions. Menu and form driven functions like Consultation (15.8 clicks/unit), imaging (14.5 clicks/unit), and medication orders (9.4 clicks/unit) required burdensome user input.

CONCLUSIONS: EHR activity consumes a majority of visit time and shifts the clinician's focus away from the patient. EHRs also introduce multitasking, which has been associated with medical errors, clinician dissatisfaction, and missed opportunities for physician-patient communication. While some time-and-motion studies have reported little or no change in visit duration for EHR-based versus paper-based visits, we observed that higher EHR activity is associated with longer visits. These associations while not conclusive, provide partial validation of physicians' concerns that poorly designed and implemented EHRs can lower clinical productivity. Our study highlights unintended inefficiencies introduced in clinical work due to poorly designed EHR user interfaces and emphasizes the need to address EHR usability as a key area for improvement to support meaningful use.