Improving Social Determinants of Health

Effectiveness of a Web-Based Intervention

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Introduction: Although patients who experience health-related social problems such as food insecurity are at increased risk for negative health outcomes, there are few systems for screening and intervention. The study aimed to determine whether a web-based intervention can (1) connect youth to services to address these problems and (2) increase their resolution.

Design: Prospective intervention study.

Setting/participants: A total of 401 youth, aged 15–25 years, from an urban adolescent/young adult clinic were recruited.

Intervention: A self-administered, web-based tool was developed to screen participants for problems in nine health-related social domains, identify and provide feedback about potential problems, and facilitate a patient-centered selection process of recommended local health and human service agencies to assist in addressing selected problems (conducted in 2008–2010). Follow-up phone calls 1–2 months later determined if patients had contacted recommended agencies and resolved their top-priority problem.

Main outcome measures: Outcome measures included prevalence of identified problems, selected problems, and priority problem selected by domain. We also examined frequencies of referral agencies contacted and resolution of priority problem at time of follow-up analysis conducted in 2011–2013.

Results: Seventy-eight percent (313/401) of youth selected at least one problem to address. The most frequent domains selected as priority were income security (21%); nutrition/fitness (15%); and healthcare access (15%). Eighty-three percent (259/313) were reached at follow-up; overall, 40% contacted a selected agency and 47% reported "completely" or "mostly" resolving their priority problem.

Conclusions: When provided with services to address health-related social problems, the majority of youth choose to receive help, with nearly half successfully addressing their priority concern. Further research to understand the barriers to contacting and utilizing services is needed. A technology-based patient-centered feedback and referral system for social determinants of health can facilitate screening and connect patients with resources to address these problems.
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Introduction

Social needs such as safe housing and food security play a significant role in health and life expectancy, and addressing unmet social needs is critical for optimizing patients' health.[1,2] In particular, the health of adolescent and young adults ("youth") is deleteriously affected by social problems.[3–5] Youth with food-insecure families have higher rates of hospitalization; those with housing instability have difficulty accessing routine care.[6–9] In addition to short-term implications, adolescence is a key period for the adoption of health behaviors

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that strongly track into adult life, suggesting that interventions that address the social needs of youth are critical to improving health and well-being across the life course.[10,11]

The American Academy of Pediatrics, Healthy People 2020, and the National Prevention Strategy under the Affordable Care Act each recommend screening for major social determinants of health in primary care.[12–14] There is limited but growing interventional research on addressing unmet social needs as part of the medical visit. A study by Haas et al.[15] found that low-SES adult smokers who received referrals to a myriad of community resources, including smoking cessation, had higher rates of smoking cessation compared with routine physician counseling. Similarly, mothers of infants receiving information about community resources as part of a pediatric screening and referral system had higher rates of employment, child care, and fuel assistance 12 months later.[16]

The use of technology with adolescents has improved medication compliance, reduced high-risk behaviors, and monitored disease symptoms.[17–19] Although studies have shown the positive impact of computer-based screening to identify psychosocial problems,[20–22] few systems incorporate screening with referrals to services. An integrated screening and referral system, used during routine medical care, could link patients with resources to address unmet needs and may ultimately improve health outcomes. This study evaluates whether a web-based intervention would (1) connect youth to services to address specific social problems and (2) help resolve these problems.

Methods

Study Sample

The study method has been previously published and is summarized in brief here.[23] This was a prospective intervention study conducted in an urban hospital–based adolescent and young adult clinic. Eligible participants included patients aged 15–25 years presenting for a visit with a medical provider between December 2008 and August 2010. We excluded patients whose providers felt they were significantly distressed at time of visit; we also excluded participants unable to comprehend the intervention because of language barriers or significant developmental delay.

Intervention

A tool called The Online Advocate was developed to address health-related social problems. The Online Advocate is a self-administered, web-based tool designed to screen participants for problems in nine health-related social domains (Table 1); identify and provide feedback about potential problems; and facilitate a patient-centered selection process of recommended local health and human service agencies to assist in addressing selected problems.

The screening questionnaire was developed from validated screens and questions from surveys such as the Youth Risk Behavior Survey, the Growing Up Today Study, and U.S. Department of Agriculture food security scales.[25–27] The system screens for and identifies problems, which are then linked with the resources within our agency database.

Once the questionnaire was completed, the tool provided feedback about identified problems and asked participants if they wanted to receive help to address any of those problem(s). Participants could additionally select assistance from a comprehensive list including needs not identified by the questionnaire (Appendix, available online). Those participants who selected multiple problems to address designated their top-priority problem (Figure 1). Participants did not have to select any assistance.

The referral portion of the tool matched selected problems to a list of health and human service agencies from a database of more than 650 agencies in greater Boston. An algorithm prioritized the recommendation of agencies based on patients' selected needs and geographic proximity to the participant's home address. Participants selected agencies and received a printout of relevant referral information, including contact information, directions, agency hours, and public transportation. For example, participants who wished to address food insecurity were matched to agencies that assist with federal programs, including Supplemental Nutrition Assistance Program (SNAP) and Women, Infants, and Children (WIC); food pantries; and local low-income farmers markets. The majority of the resources and services were free of charge; the clinic did not provide monetary support for services.

Study Design

Multiple studies, including our intervention study, were listed on a research recruitment flag attached to patients' paperwork. Providers asked eligible patients if they wanted to participate in a research study; those interested were referred to the resource specialist, a clinic staff member trained in social service referral, for more information. Because most providers did not record information about recruitment attempts, we could not calculate an overall refusal rate. Two of the main clinic providers tracked their patients and found that 20% declined further information. The resource specialist provided an explanation of the study, obtained informed consent, and logged participants onto a laptop computer equipped with a privacy screen to begin the intervention. Patients aged <18 years were granted a waiver of the requirement of parental consent in accordance with adolescent health research guidelines.[28]

Participants took part in a multistep process. They completed the questionnaire, received feedback about identified problems, selected problems for assistance, identified their top-priority problem, and selected referral agencies. Each participant met briefly with the resource specialist to review referrals and then received a customized printout of the agencies. If questionnaire responses indicated acute concerns regarding domestic violence, homelessness, or severe food insecurity, the results were immediately shared with the provider and social worker to facilitate urgent intervention. Participants took 25 minutes on average to complete the entire intervention.

Table 1. Problems Identified and Problems Selected to Address

Problems by domain (N=401)	Problems identified by system,[a] *n* (%)	Problem selected to address as top priority,[b] *n* (%)	Problem selected to address (any priority),[c] *n* (%)
Nutrition and fitness		60 (15)	169 (42)
Major: Disordered eating behaviors (purging, using laxatives or diet pills, or fasting for >24 hours to lose weight): 4%	16 (4)		
Minor: Barrier to regular exercise because of no access to recreational facilities or organized sports and exercise/ programs; BMI > 25 (overweight or obese); trying to lose or gain weight and need for nutritional counseling	279 (70)		
Education		40 (10)	109 (27)
Major: Dropped out of high school; unmet learning disability	55 (14)		
Minor: Failing grades; irregular attendance	59 (15)		
Safety equipment		1 (<1)	16 (4)
Major: Need for smoke/carbon monoxide detectors; no car seat for child	24 (6)		
Minor: Need for bike helmet	37 (9)		
Healthcare access		59 (15)	150 (37)
Major: No health insurance; unable to receive prescriptions; unable to receive medical care; unmet dental needs	148 (37)		
Minor: No routine medical checkup in the past 5 years; no routine dental care in the past 5 years	37 (9)		
Housing		33 (8)	101 (25)
Major: Homeless; utilities shut off; structural problems	135 (34)		
Minor: Need fuel/heating assistance; threat of utilities shut off in past 12 months; if renting or receiving subsidized housing, concern about transfer or eviction	87 (22)		
Food security		15 (4)	67 (17)
Major: Food insecure or hungry	117 (29)		
Minor: Met criteria for WIC but does not have it	10 (2)		
Income security		85 (21)	149 (37)
Major: Out of work and trying to find a job (if >18 years and not in school)	41 (10)		
Minor: Out of work because of disability but do not receive SSI or SSDI; meet criteria for TANF but do not receive services; have a child, should receive child support but does not; have a child that meets criteria for Headstart, but not enrolled	84 (21)		
Substance use		0	6 (2)
Major: Positive CRAFFT[24] score; current tobacco use	81 (20)		
Minor: Illegal drug use in past 6 months	50 (12)		

(continued on next page)

Table 1. Problems Identified and Problems Selected to Address *(continued)*

Problems by domain (N=401)	Problems identified by system,[a] *n* (%)	Problem selected to address as top priority,[b] *n* (%)	Problem selected to address (any priority),[c] *n* (%)
Interpersonal violence			
Major: Physical, verbal, or sexual abuse in past 12 months	64 (16)	4 (1)	11 (3)
Other (not screened for but participants could select and choose help)		16 (4)	79 (20)
Sexual health needs (contraception, sexually transmitted infection screening, pregnancy counseling, abortion services, resources for gay-lesbian-bisexual-transgender individuals)	—	0 (<1)	18 (4)
Special health care needs (help for individuals with autism, Asperger's, physical and cognitive disabilities)	—	0	0
Mental health needs: counseling or therapy	—	15 (4)	48 (12)
Parenting needs: child care, parental supports, Headstart, help with breastfeeding	—	1 (<1)	13 (3)

[a]Percentage of participants with one or more system-identified individual problems within each domain.
[b]Percentage of participants designating their priority problem by domain.
[c]Percentage of participants selecting one or more problems and accompanying resources by domain.
SSDI, social security disability insurance; SSI, supplemental security income; TANF, temporary assistance for needy families; WIC, Women, Infants, and Children.

One to 2 months later, participants who selected referrals received a follow-up phone call by a trained research assistant and completed a brief structured interview to determine if they had (1) contacted agencies to address their top-priority problem (yes/no) and (2) resolved this problem (*completely*, *mostly*, *somewhat*, or *not at all*). If contact had not been made with an agency, participants were asked about potential barriers, if the problem still existed, and if other resources had been used. We considered participants lost to follow-up if multiple attempts to contact were unsuccessful up to 8 weeks after the intervention. The hospital IRB approved the study protocol.

Sample Size and Statistical Analysis

We selected a sample size to provide a 95% CI no wider than 10% around estimated percentages of health-related social problems. We estimated that a total of 400 patients were needed based on the following assumptions: 75% of youth would screen positive for at least one problem, 75% of this group would choose at least one problem for which to receive assistance, 50% of this group would contact an agency for help, and we would reach 50% of this group for follow-up.

Participants screening positive for one or more designated problems within each social problem domain were defined as having a system-"identified" problem. Participants selecting problems and matched referrals were defined as having "selected a problem." We determined the prevalence of identified problems, selected problems, and priority problem selected by domain. We also examined frequencies of referral agencies contact and resolution of the priority problem. Participants who had *completely* or *mostly* resolved the problem at time of follow-up call were defined as "problem resolved"; those who responded *somewhat* or *not at all* were defined as "problem not resolved."

Chi-square tests evaluated differences in selection of problems to address and top problem resolution by race/ethnicity, age, and gender; by cumulative burden of problems; and by social domain. Additionally, a Pearson correlation coefficient was calculated to examine the correlation between number of problems identified by the system versus number of problems participants selected to address. Finally, we conducted logistic regression analyses adjusted to determine if cumulative burden of problems identified or type of problem selected for assistance predicted: (1) contact with an agency and (2) priority problem resolution. All analyses were performed using SAS, version 9.2.

Results

A total of 444 participants expressed initial interest and 401 (90%) consented and completed the entire study. The main reasons cited for declining included lack of interest or time. The demographic distribution of the study sample was 69% female, 54% black, 29% Hispanic, and 9% white, with a mean age of 18 years. We found only small differences between the final study sample and our clinic population with respect to SES (44% vs 41% Medicaid, not statistically significant); gender (69% vs 60%); and race (54% black vs 49% black).

Seventy-six percent (304/401) of adolescents had at least one health-related social problem identified, and 47% (190/401) experienced social problems in two or more domains (Table 1).[23] The most prevalent problems included health-care access (37%); housing (34%); and food security (29%). Seventy-eight percent (313/401) selected at least one problem to address and chose accompanying referral resources, with a median number of four problems selected per participant.

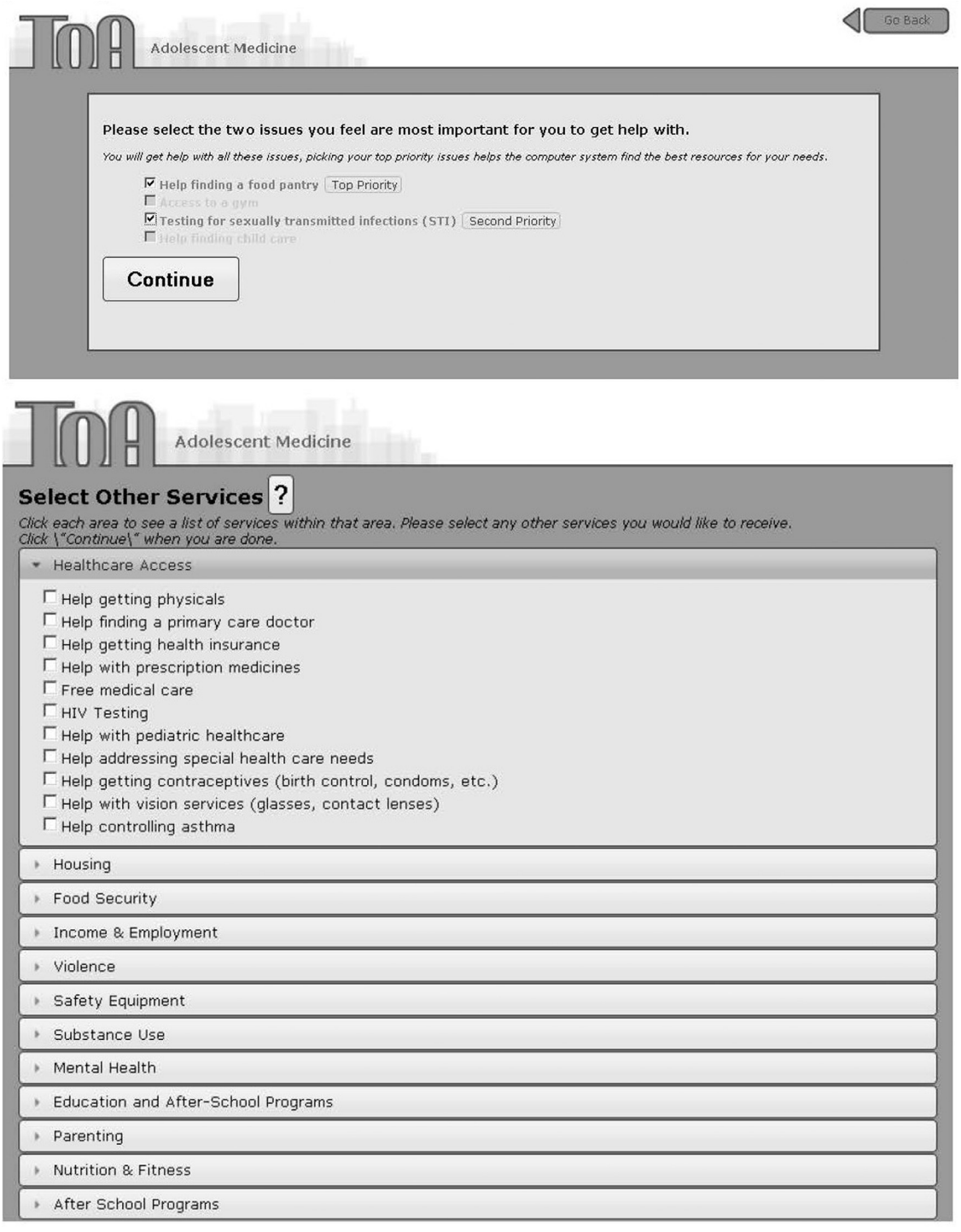

Figure 1. Screen shots of selecting and prioritizing referrals based on system feedback and selecting additional unmet needs.

Participants could select problems even if not identified by the system; likewise, participants could choose not to select any problems regardless of system feedback.

The problems participants selected to address did not always match the problems identified by the system. Assistance was most frequently selected for problems with nutrition and fitness, healthcare access, and income security, with the top-priority problem designated within these domains at rates of 15%, 15%, and 21%, respectively (Table 1). For example, although only 4% of participants

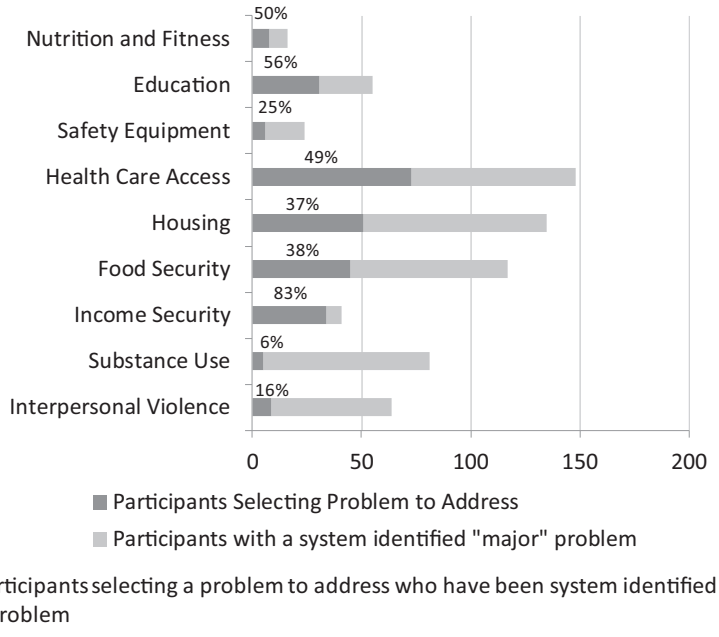

Figure 2. Proportion of participants with a system identified major problem and selection of problem for assistance by social domain (N=401).

had an identified major problem within nutrition and fitness, defined as the presence of disordered eating behaviors, 42% selected assistance in this domain, with the majority requesting help joining a gym or accessing a nutritionist. Similarly, 10% of participants were identified as having a major problem within the income domain, but 37% selected help in this domain including assistance finding a job.

Figure 2 presents (1) the number of participants with a major problem in a given domain identified by *The Online Advocate* and (2) the percentage of those participants that selected to address a problem in that domain. The most-significant discrepancies were within the substance use and interpersonal violence domains; only 6% of those identified with a major problem with substance use and 14% of those

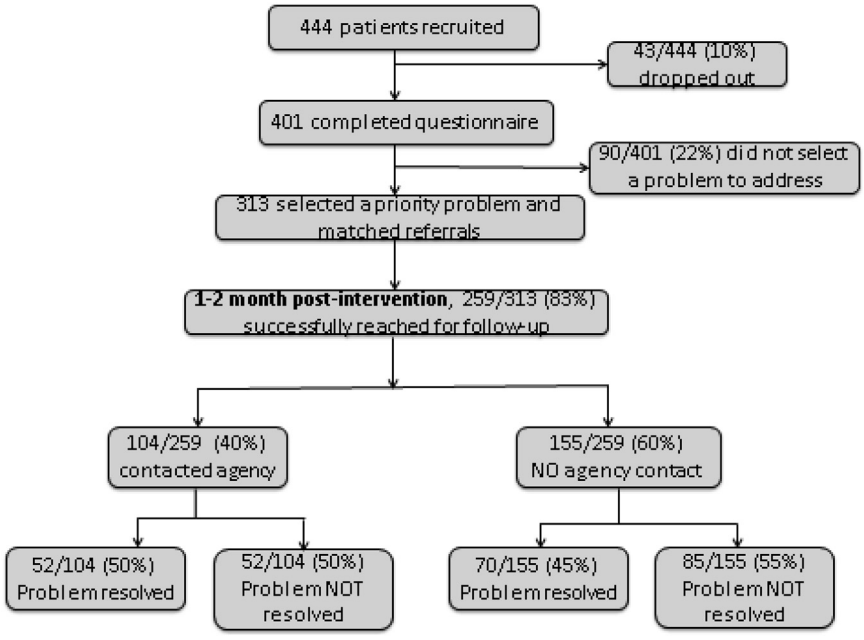

Figure 3. Intervention recruitment through follow-up.

Table 2. Successful Resolution of Top Priority Problem by Domain

Domain of top priority problem selected by participant	Reached for follow-up at 1 or 2 months (*n*=259, 83%) *n* (%)	Problem "completely" or "mostly" resolved (*n*=122, 47%) *n* (%)
Nutrition and fitness	46 (77)	29 (64)
Education	29 (73)	17 (59)
Safety equipment	1 (100)	0
Healthcare access	49 (83)	28 (60)
Housing	28 (85)	8 (30)
Food security	13 (87)	7 (58)
Income security	76 (89)	27 (36)
Substance use	n/a[a]	n/a
Interpersonal violence	4 (80)	2 (50)
Other	13 (81)	4 (31)

[a]No participants selected a problem related to substance use as their top priority.
n/a, not applicable.

with a major problem with domestic violence selected assistance in those domains.

We found a positive correlation between the number of major problems identified by the system and the number of problems selected by the participant to address. As the total number of identified problems increased, the total number of problems selected by the participant also increased (ρ=0.45, $p<0.0001$). Female youth were significantly more likely to select a problem to address than male youth (83% vs 66%, $p<0.001$).

Eighty-three percent (259/311) of the participants who selected a priority problem to address were reached for follow-up (Figure 3). Of these, 40% (104/259) had contacted a referral agency for their top priority; of these, 50% (52/104) reported their top-priority problem either "completely" or "mostly" resolved. In addition, 45% (70/155) of participants who did not contact a selected agency reported resolution of the problem. Participants who did not use the recommended agencies were asked how they addressed the problem, and the large majority (>90%) reported accessing other resources, including counselors or teachers at school, other agencies, religious groups, neighbors, and family.

Overall, 47% (122/259) of all participants who selected a problem to address reported resolution of their top priority problem. This varied by social domain, with a high resolution rate of 64% for nutrition/fitness and a low resolution rate of 30% for housing and 36% for income support (Table 2). Although male youth were more likely to contact an agency than were female youth (45% vs 29%, p=0.008), no demographic characteristics were significantly associated with success of resolving problems.

In adjusted analyses, cumulative burden of problems or problem type was not associated with contacting an agency. Problems related to income security had a significantly lower resolution rate (AOR=0.40, 95% CI=0.22, 0.73, p=0.003), whereas those related to nutrition and fitness had a higher resolution rate (AOR=2.41, 95% CI=1.20, 4.84, p=0.01).

Discussion

There is a dearth of research regarding how to effectively screen and address the social needs of youth. Although previous studies have examined the feasibility of computer interventions in the primary care setting, this study is among the first to use a patient-centered tool to provide direct feedback to participants and facilitate self-selection of social services for assistance. The majority of patients (78%) using our system were interested in assistance to aid them in resolving social problems. Forty percent contacted one of the selected agencies and about half resolved their top problem with minimal support from clinic staff. These follow-up rates are on par with studies of referrals to medical subspecialties.[29] Referrals from the United Way's "211" program have reported success rates of 20%.[30] With a large number of patients potentially addressing problems with this intervention, clinician and social work resources can focus on patients requiring intensive management, such as those who are homeless or in abusive relationships, thus lessening the burden placed on providers.

One of the goals was to streamline our system into the clinical setting. By using a web-based program on laptops, participants maximized time spent in waiting or exam rooms without disrupting the actual visit. Another critical component was the built-in database of service agencies that provided the resources. Without access to referral resources, screening by providers is less likely to occur; therefore, many clinicians do not screen or provide referrals for their patients.[31,32] Our intervention did include a resource specialist who assisted with addressing urgent issues that may arise during the screening process and allowed for more effective use of higher-level support staff.

We found an incongruity between system-identified problems and problems that participants wished to address. In fact, the only domains in which more than half of the participants selected problems to address when receiving feedback about a system-identified problem were education (56%) and income security (83%). Conversely, only 6% of those identified with a substance use problem requested help

with this issue. Many participants requested services for unmet needs that were not identified by the system such as help finding employment or support for healthy eating. These findings suggest two key points: (1) even in-depth screening might not get at the patient's own identified needs; and (2) participants may benefit from an intervention that bypasses screening altogether and allows them to select resources directly, which would shorten the entire process.

One unanticipated finding was that 45% of the participants who did not contact a selected referral agency still reported successful resolution of their top-priority problem. As part of the brief semi-structured interview at follow-up, participants who fell in this category were asked if other resources were used. Although some reported that the problem had resolved without any intervention, a large number indicated that they had sought out help elsewhere. Qualitative data collected during the initial stages of the study confirmed that participants felt that using the system motivated them to seek help they might not have otherwise sought,[22] and speaks to the screening tool itself as being a potentially worthwhile intervention.

Given that male youth are less likely than their female peers to seek medical services,[33,34] another unanticipated finding was that our male participants were more likely to contact recommended agencies for their priority problem. One possible explanation is that recruitment took place in a medical setting and thus the male youth presenting for their appointments are more engaged in their health at baseline.

The specific problem domain was predictive of resolution of the problems. Participants had more success resolving problems related to nutrition and fitness. Part of the reason for success may have been available onsite resources. Many of the services identified in the nutrition domain included access to nutritionists, resources for healthy eating, and increased access to nutritious foods. Within our office, an appointment could be made with a nutritionist upon checkout, and referrals for multiple community resources such as local food pantries, farmers markets, and dollar-a-bag food stores could be provided at the end of visit. This is in contrast with participants who selected problems with income security, as they were less likely to resolve their problem. These problems included unemployment help. Given our participants' ages, their overall limited work experience, and lack of available jobs, it is not surprising to have lower success in resolving this issue within the 1–2-month follow-up period.

Limitations

Our study is limited by a single healthcare setting, so results may not generalize. Self-selection bias may have influenced patients to participate; however, youth were not required to seek parental consent, which hopefully decreased the likelihood of selection bias. Though the system screens for highly sensitive problems, computer-based screening tools have demonstrated high rates of disclosure, especially with regard to sensitive issues.[35,36] Although we lack follow-up data on some participants, we reached the vast majority of the intended group for follow-up. The natural history of social problems—how and when they resolve "on their own"—is not known. Though a large percentage of participants who did not follow up with their referrals stated they resolved their problems, the majority indicated that the screening and referral selection process helped them figure out how to help themselves. Desirability bias by participants may have led to over-reporting resolution of their problems.

Conclusions

Youth experience a high burden of health-related social problems and are interested in receiving help to address these concerns. This study demonstrates that a system like *The Online Advocate* can successfully screen and provide resources to participants as part of the medical visit, thus enabling clinicians to provide a "prescription" for unmet social needs. Future research should determine how medical systems, large and small, can support the implementation of social service referral processes using similar technology, thus minimizing the cost of additional team members and allowing for potential wide dissemination. Although health clinicians recognize that shelter, food, and education are critical to one's health and well-being, the next step must determine how to create services, policies, and education that allow clinicians to treat these social determinants of health.

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AH: Co-principal investigator; responsible for study design, data collection, data analysis, and manuscript preparation. Had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. EAB: Made substantial contributions to data analysis, interpreted the results, and provided assistance with manuscript preparation, including review and critique of each version of the manuscript. ABP, GM: Provided software development, assistance with development of the questionnaire, and manuscript preparation and revision. EGK, LM: Contributed to acquisition of data and provided assistance with manuscript preparation and revision. ERW: Contributed to conception and design, as well as manuscript preparation and critique of each version of the manuscript. EWF: Co–principal investigator; responsible for study design, data analysis, and manuscript preparation.

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Appendix

Supplementary data

Supplementary data associated with this article can be found at, http://dx.doi.org/10.1016/j.amepre.2015.04.023.