Food Insecurity Screening of Medically-Complex Patients: An Improvement Project in Multidisciplinary Pediatric Clinics

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Abstract

Food insecurity, or inadequate access to food for an active, healthy life due to limited money and resources, adversely impacts a child's growth development, health, and well-being (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2020; Hager et al., 2010; Palakshappa et al., 2020; Schwartz, Buliung, & Wilson, 2019). Children with disabilities and complex medical needs have greater risk for food insecurity (Schwartz et al., 2019). National pediatric organizations encourage routine screening for household food insecurity and referrals to appropriate services and food resources. This quality improvement project aimed to improve food insecurity screening, identification and assessment of food insecure families, the provision of food resources, and provider confidence in screening for and addressing food insecurity at a group of multidisciplinary, subspecialty pediatric clinics. Implementation of a standardized screening and referral process resulted in a significantly improved screening rate, compared to the baseline rate pre-intervention, improved patient and family-centered care, and increased provider confidence in helping families experiencing food hardship. However, given what is known about food insecurity related to screening methods, stigma, and the COVID-19 pandemic, as well as the limitations of this project including time frame, more work is needed to gain a better understanding of the prevalence of food insecurity at the clinics and the effectiveness of the interventions over time. Interdisciplinary collaboration, along with community engagement and partnerships, will help to bridge the connection between families and nutrition resources.

Food Insecurity Screening of Medically-Complex Patients: An Improvement Project in Multidisciplinary Pediatric Clinics

Food insecurity, or inadequate access to food for an active, healthy life due to limited money and resources, adversely impacts a child's growth development, health, and well-being (Coleman-Jensen et al., 2020; Hager et al., 2010; Palakshappa et al., 2020; Schwartz et al., 2019). Nutrition is a key factor in childhood development, and children in food insecure households are faced with more cognitive, emotional, behavioral, and physical health challenges throughout their lives (Barnidge, LaBarge, Krupsky, & Arthur, 2017; Shankar, Chung, & Frank, 2017). These children are at higher risk for developmental delay, chronic disease, hospitalizations, obesity, mental health disorders, and poor academic performance and social skills compared with children in food-secure homes (Barnidge et al., 2017; Knowles et al., 2018; Makelarski, Abramsohn, Benjamin, Du, & Lindau, 2017; Shankar et al., 2017; Tester, Rosas, & Leung, 2020).

In 2018, about 11% of total U.S. households were food insecure (Coleman-Jensen et al., 2020), with a higher prevalence in households with children (13.9%) (Coleman-Jensen et al., 2020; Palakshappa et al., 2020). In Oregon between 2015-2017, for example, approximately 1 in 8, or 12.9% of total residents (including children) were food insecure (Force, 2018). Poverty is a strong risk factor; Children in single parent households, households with incomes at or below the federal poverty level (Barnidge et al., 2017; Coleman-Jensen et al., 2020), and receiving public insurance are more likely to experience food insecurity (Palakshappa, Vasan, et al., 2017). Black and Hispanic or Latino children living in urban or rural areas are disproportionately impacted; An estimated 1 in 4 non-Hispanic Black households with children are food insecure (Barnidge et

al., 2017; Coleman-Jensen et al., 2020; Cullen, Woodford, & Fein, 2019; Palakshappa, Vasan, et al., 2017).

Given the prevalence of food insecurity and implications to pediatric health, national pediatric organizations such as the American Academy of Pediatrics (AAP) and the American Pediatric Association encourage pediatric healthcare providers to routinely screen for household food insecurity and make appropriate referrals to services and resources at scheduled health maintenance visits or sooner, if indicated (Barnidge et al., 2017; Pediatrics & Nutrition, 2015). Several food insecurity screening tools exists, however, clear guidelines on how to select and implement screening tools are lacking and have contributed to the variability in screening observed (De Marchis, Torres, Fichtenberg, & Gottlieb, 2019; Palakshappa et al., 2020).

Target Population

Children with disabilities and complex medical needs are a vulnerable group with greater risk for food insecurity (Schwartz et al., 2019). Studies have reported the prevalence of food insecurity to be higher among households with persons with disabilities than that for the general population (Schwartz et al., 2019). Similarly, food-insecure households were more likely than food-secure households to include someone with a disability (Park, Kim, Kim, Jeoung, & Park, 2020). One study found that low-income households with children special health care needs were more likely to experience food insecurity, regardless of child social security income receipt and household participation in other public assistance programs (Rose-Jacobs et al., 2016). The negative impact of insufficient food or a low-quality diet and compromises to health may be greater in persons with disabilities, indicating a potential need for enhanced food insecurity surveillance (Park et al., 2020).

Problem Statement

A group of multidisciplinary, subspecialty pediatric clinics (SSC), such as child development, feeding, spina bifida, craniofacial, and hemophilia clinics, in the Pacific Northwest of the U.S. did not have a standardized tool or system to screen or chart for food insecurity, and respond to positive screens. A recent audit of the six SSC found that food insecurity was poorly screened for; Patient charts by nurse practitioner providers between September 2019 and March 2020 were reviewed, and only 12 of a total 18 charts (67%) documented about food insecurity. Additionally, screening results were charted differently by each provider. The low screening rate and inconsistent documentation is a critical problem to addressing food insecurity in some of the Pacific Northwest's most vulnerable pediatric populations.

The SSC serves high-risk children with complex medical needs, and the pediatric healthcare providers are uniquely positioned to address food insecurity within the health care setting. Efficient and effective strategies are needed to identify and support individuals living in food-insecure households. This quality improvement project focused on strategies to improve 1) assessment and care of food insecure families and 2) provider confidence in caring for families that are food insecure.

Review of the Literature

A literature review was conducted to explore the methods and tools that are available for pediatric health care settings. Screening challenges and opportunities were also examined in order identify an approach that would be most effective at the SSC.

Search Strategy

A comprehensive literature review was performed to investigate the food insecurity screening, with particular focus on tools and methods used in pediatric health care settings. Critical appraisal was done for articles on the impact of food insecurity on childhood development, and the development and validation of screening tools and how they have been integrated into pediatric healthcare delivery, and facilitators and barriers to screening. Multiple searches were performed in the online databases CINAHL Nursing and PubMed, as well as the Google Scholar search engine. Different combinations of the following key search words were used: "food insecurity," "screening," "pediatric," "children," "development," "malnutrition" and "disability." References consulted were primarily peer-reviewed journal articles, research articles, and evidence-based practice articles. Older, frequently cited sentinel manuscripts were included in the literature review.

Food Insecurity Screening Tools

A number of surveys and questionnaires to screen for food insecurity are available. The 18-item U.S. Department of Agriculture-Food Security Survey (USDA-FSS) is the gold standard in assessing household food insecurity, and has high sensitivity and specificity (98% and 92%, respectively) (Makelarski et al., 2017). However, the time needed to administer the survey due to its length and complex scoring algorithm limit its use in the clinic setting (Hager et al., 2010). Shortened questionnaires have since been developed, including the 6-item USDA-FSS (short-form version with excellent sensitivity and good specificity), two brief 1-item, dichotomous (yes/no) screeners, and the 2-item Hunger Vital Sign (HVS) (De Marchis et al., 2019; Hager et al., 2010). They are derived from and validated against the USDA-FSS (De Marchis et al., 2019;

Kleinman et al., 2007). Other tools that screen for basic and social needs and multiple issues that impact child health have been developed for pediatric settings, but they are not exclusive to food insecurity and the questions used have not been validated.

The brief 1-item screeners and HVS are among the most commonly validated, accepted and feasible food insecurity screening tools to use for families with children (De Marchis et al., 2019; Hager et al., 2010). The first 1-item screener has the lowest sensitivity (59%) and highest specificity (87%) amongst the three tools (Lane, Dubowitz, Feigelman, & Poole, 2014). The second 1-item screener was developed and initially administered in an inner-city primary care pediatric clinic that serves primarily a low-income community (Kleinman et al., 2007). It has the second-best sensitivity (83%) and lowest specificity (80%), and focuses on risk for hunger (i.e. physiological sensation of involuntary lack of food) (Kleinman et al., 2007). However, as Hager and colleagues (2010) stated, food-insecure families that do not experience hunger, but experience stress related to uncertain access to adequate food may be missed by this tool. Furthermore, studies suggest that the negative effects of food insecurity on child health and outcomes occur before the experience of hunger or "reaching the threshold for hunger" (Hager et al., 2010). The HVS was developed by Hager and colleagues (2010) as a more sensitive screen for food insecurity.

The Hunger Vital Sign. The HVS has the highest sensitivity and second-best specificity amongst the three tools (De Marchis et al., 2019; Hager et al., 2010). The use and accuracy of the HVS (Likert scale version: often true, sometimes true, never true) was examined in more than 30,000 families with children younger than 3 years surveyed across 7 large urban medical sites (acute and primary care clinics and hospital emergency departments) (Hager et al., 2010).

Food-insecure families were identified with excellent sensitivity (89-97%) and good specificity (83-84%); An affirmative response (i.e. often true, sometimes true) to either of the two statements was associated with increased likelihood of caregiver-reported poor/fair child health versus good/excellent ($P<0.001$), child hospitalizations ($P<0.001$), and child developmental risk ($P<0.001$) (Hager et al., 2010). These associations supported prior data on the 18-item USDA-FSS, found by the group's Community Childhood Hunger Identification Project and Children's HealthWatch (Hager et al., 2010). The AAP issued a policy statement in November 2015 endorsing the use of the HVS (Pediatrics & Nutrition, 2015). While the AAP advocates for a dichotomous adaptation of the HVS (yes or no), this version has been found to be less sensitive and have lower diagnostic accuracy than the Likert version (Makelarski et al., 2017; Palakshappa et al., 2020).

Screening Acceptability

In general, screening for food insecurity is viewed by both clinicians and parents/guardians as an important component to health care visits. According to a recent systematic review by De Marchis and colleagues (2019), studies showed a range of 80-89% of surveyed clinicians were willing to include screening during patient visits, and a range of 66%-88% of parents/guardians considered it acceptable for clinicians to ask about food insecurity during health care visits. Interviews of providers who screened for food insecurity perceived their patients to feel better cared for and that their relationships with patients improved as a result (De Marchis et al., 2019; Palakshappa, Doupnik, et al., 2017). Screening was also considered to be more appropriate in certain clinical settings than others, such as in primary care versus acute care settings (Barnidge et al., 2017; De Marchis et al., 2019), and written questionnaires were

perceived by some providers as extra paperwork and an additional administrative burden (Knowles et al., 2018).

Screening Method and Disclosure Rates

Food insecurity screening tools are either self-completed by parents/guardians (e.g. paper or computer/tablet-based questionnaires) or administered face-to-face by health care staff (i.e. physician, advanced practice provider, medical assistant, nurse, research assistant, etc.). The majority of studies suggest that families, particularly food insecure families, prefer paper-based over verbal, provider screening, and are more likely to answer them honestly because of the perceived anonymity and limited face-to-face interaction (Barnidge et al., 2017; De Marchis et al., 2019; Knowles et al., 2018; Palakshappa, Doupnik, et al., 2017; Palakshappa et al., 2020). Information is needed to understand how disclosure rates are impacted by who administers the screen (i.e. physician, advanced practice provider, nurse, medical assistant, research assistant, etc.) (Barnidge et al., 2017; De Marchis et al., 2019).

More food insecure families are identified through self-administered, written questionnaires over face-to-face screening (Cullen et al., 2019; Knowles et al., 2018; Palakshappa et al., 2020). In Knowles et al. (2018), families with children less than 5 years were surveyed using the HVS tool at three pediatric primary care clinics at a large, urban medical center; The rate of food insecure families reported via the paper-based screen (45.5%) was greater than six times the rate for the verbal, provider-administered screen (7.2%) (Knowles et al., 2018). Similarly, at a large pediatric academic primary care clinic, Palakshappa and colleagues (2020) found a significant difference in disclosure rates between families (with children 18 years and younger) screened via written HVS (16.3%) versus verbally (10.4%;

P<0.001). Changing the screening modality from verbal to the paper-based in the middle of the study was also associated with an immediate and significant increase in disclosure rates (P=0.02), which remained elevated even nine months after the tool was implemented (Palakshappa et al., 2020).

Likewise, increased rates of food insecurity have been found using electronic-based, self-administered questionnaires. Two randomized trials in pediatric emergency departments showed that parents/guardians were more likely to disclose food insecurity when screened on a tablet versus face-to-face (Cullen et al., 2019; Palakshappa et al., 2020). Though limited data on the use electronic-based questionnaires in primary care exist, this adds to the data supporting the use of self-administered methods. The lower levels of positive screens with verbal screening suggests that food insecurity may not be accurately revealed with that method, potentially leading to underestimation.

Other Facilitators and Barriers

Caregiver-provider relationship. Interviews and focus groups of both clinic staff and parents/guardians identified trust and care between caregivers and staff as a key facilitator to food insecurity screening (Knowles et al., 2018). Parents/guardians are more willing to share sensitive information if they feel comfortable with their provider, and recognize screening to be a routine part of care and as a way for clinics to offer services (Knowles et al., 2018; Palakshappa et al., 2020). Food insecure parents/guardians are more likely to be reluctant to identify themselves as food-insecure out of shame and fear of being perceived as unfit caregivers and/or involvement of child welfare/protective services (Barnidge et al., 2017; De Marchis et al., 2019; Knowles et al., 2018; Palakshappa et al., 2020). Studies suggest that normalization of screening

and presenting questions in a way that acknowledges caregivers' challenges, expresses concern for family well-being, and addresses privacy concerns may help to reduce the stigma associated with food insecurity and encourage parents/caregivers to answer honestly (De Marchis et al., 2019; Knowles et al., 2018).

Support in accessing resources and services. Focus groups of parents/guardians identified assistance in navigating referrals and government benefits applications as one of the most helpful facilitating factors to screening (Knowles et al., 2018). In Knowles et al. (2018), food insecure families were connected to a referral agency that would perform benefits eligibility screening, application assistance, and referrals to community resources and financial counseling. The study found that poor communication between health care staff (providers, social workers, etc.) and families about the referral process, as well as delayed communication and inability for caregivers, health care staff, and agencies to connect resulted in many families being "lost to follow-up" (Knowles et al., 2018). Important caveats are that those who screen positive may not even be eligible for benefits, not all patients who screen positive for FI want help, and conversely, some who want help may not screen, which are discussions that are beyond the focus of this project (De Marchis et al., 2019; Knowles et al., 2018).

Provider uncertainty and confidence. Practitioners' uncertainty in how to address positive screens is another frequently reported barrier to survey administration and follow-up conversations with food insecure families (Barnidge et al., 2017; De Marchis et al., 2019). Providers who are unfamiliar with the services and resources available are less likely to screen and/or address positive screens (Barnidge et al., 2017; Makelarski et al., 2017; Palakshappa, Vasan, et al., 2017). Training practitioners on social determinants of health or food insecurity

screening, specifically, has been demonstrated to improve rates of food insecurity screening, practitioners' self-reported competence and confidence around screening, and the amount of time spent discussing social needs (De Marchis et al., 2019).

Time constraints and work flow. Time is a frequently reported barrier to food insecurity screening (Barnidge et al., 2017; Bottino, Rhodes, Kreatsoulas, Cox, & Fleegler, 2017; De Marchis et al., 2019; Knowles et al., 2018). While patient-completed questionnaires can be time-consuming and typically take longer than provider-administered screening, the time it takes to complete screening varies depending on the screening tool and administration method. In the review by De Marchis et al. (2019), several studies showed that provider-administered screening ranged from an average of 30 seconds to 10-15 minutes. Having patients complete screening before their visit has been demonstrated to be helpful for clinic flow (Adams et al., 2017; De Marchis et al., 2019; Palakshappa, Vasan, et al., 2017).

Provider concerns about not having the time to address identified needs following a positive screen have been reported, although studies also suggest that the time burden to patient visits is minimal (De Marchis et al., 2019; Knowles et al., 2018; Palakshappa, Vasan, et al., 2017). One study that evaluated resident physicians screening for social determinants of health found that only an average of 30 seconds to 3 minutes and 15 seconds were spent directly discussing social needs (not specific to food insecurity screening) (De Marchis et al., 2019). In another study focused on addressing family psychosocial problems at low-income children's well-child care visits, providers surveyed reported that "social needs screening and distribution of handouts to relevant community-based resources" took less than 5 minutes (De Marchis et al., 2019).

Overall, health care sites with standardized food insecurity screening processes, regardless of setting, are more likely to have greater rates of screening (Barnidge et al., 2017; Makelarski et al., 2017; Palakshappa, Vasan, et al., 2017). Compared to providers in low-resource clinics, providers in high-resource clinics with support staff involved in the screening and referral processes spend more time screening for social needs; One study found a significant difference of an average of 37.5 seconds versus 160 seconds, respectively ($P<0.05$) (De Marchis et al., 2019). For children with disabilities, the high risk for food insecurity underscores the pressing need for specialty clinics that serve these populations to be increasingly vigilant about screening.

Gaps in the Literature

Numerous studies have explored food insecurity screening in a variety of pediatric populations and health care settings, but gaps in the literature remain. Research to date has not addressed the appropriate frequency of screening, or the benefits and drawbacks of universal versus targeted screening; Screening frequency may need to vary across settings and populations, depending on the potential health impacts and prevalence of food insecurity (De Marchis et al., 2019). No studies have surveyed the acceptability of screening when the responsibility for screening and referral is given to different team members (Barnidge et al., 2017; De Marchis et al., 2019). The optimal workforce and related costs (i.e. financial and staff resources needed) for screening in distinct clinical settings and patient populations have not been evaluated (De Marchis et al., 2019).

Many studies have looked at low-income families, however, information on screening of low-income families with children with disabilities is limited. More research is needed to

understand implementation and effectiveness of screening, and the different administration methods, in settings that serve medically-complex children. How often this population should be screened also needs to be determined.

Purpose Statement and Aims

The purpose of this quality improvement project was to improve assessment and care of food insecure families at the SSC, specifically by improving food insecurity screening and referral activities among NP providers. To accomplish this, three project aims were established. The first aim was to improve food insecurity screening and facilitate identification of food insecure families. The second aim was to improve assessment of food insecure families and the provision of food resources, including connections to Social Work. An electronic database and written material with information on government and local food resources was developed and made accessible to providers for use following positive screens. The third aim was to improve provider confidence in screening for food insecurity and addressing positive screens. This project utilized the Plan-Do-Study-Act (PDSA) framework, which guided and better informed the change plan and interventions.

Project Approach and Methods

Context and Setting

This project was conducted at the six multidisciplinary SSC. The SSC is part of a large, urban academic medical system, and provides a variety of specialty health care services to children and youth with complex medical needs and disorders affecting development throughout the lifespan.

Organizational Readiness

Patients in the SSC receive routine, comprehensive check-ups to identify and address any concerns regarding health, development, behavior, education, and social determinants of health including food insecurity. Care is coordinated by a multidisciplinary team. In a recent audit for advanced provider practice (APP), food insecurity screening was identified as a priority for nurse practitioner practice improvement across all SSC. The SSC did not have a standardized tool or system to screen for food insecure families and respond to positive screens.

Anticipated Facilitators, Barriers, and Challenges

Project organizers included the DNP student as the project lead, a nurse practitioner at one of the SSC, the SSC APP Discipline Director, and the DNP project chair. Collaboration and clear communication amongst the organizers and stakeholders (i.e. nurse practitioners) were key facilitators of this project. Given that communication occurred primarily via virtual meetings, telephone and e-mails, barriers and challenges included timely exchanges of information and feedback, and maintaining project timelines. Ensuring clinic providers adhered to the new food insecurity screening and referral system was another challenge. Establishing clear project goals and roles helped to facilitate this process.

Participants

Participants included the nurse practitioners at each of the SSC with a total of six nurse practitioners, two of whom serve as providers at two different SSC.

Project Procedures and Outcomes Evaluation

Intervention

The validated, 2-item HVS (Likert scale) food insecurity screening tool was chosen based

on national practice recommendations, best evidence from the literature, and for its sensitivity and specificity. It was adapted to include suggested statements on the purpose of screening to provide families, as well as a question to determine whether families want assistance with their food needs, as described in the WE CARE survey by Garg and colleagues (2015) (Figure 1). The nurse practitioners administered the screen verbally during patient visits. A SmartPhrase in EPIC that included the adapted HVS was created for nurse practitioners to add to their chart note templates. This ensured screening and documentation of results directly in the patient chart note. The intervention was implemented between February and March 2021.

The nurse practitioners followed-up on positive screens by offering and briefly discussing government and community food resources available, and initiating referrals to Social Work to help families better navigate resources. A SmartPhrase in EPIC and separate PDF document that includes government and community food resources was accessible, so that the information was included in the patient's after visit summary and given to the family directly. Whether food resources were provided and families were connected to Social Work was also documented directly in the patient chart note using the HVS SmartPhrase.

Prior to implementation of the intervention, stakeholders were presented the impetus for this project and proposed methods. Detailed information on clinic data pre-intervention was provided, along with education on food insecurity screening, use of the HVS tool and SmartPhrase template, documentation, and government/community food resources. Final findings were presented to stakeholders at the end of the study in June 2021.

Sustainability

The SSC are evaluated biannually for specific quality improvement outcomes, and food insecurity screening is one of the performance metrics measured. This biannual audit will ensure that the change in workflow initiated by this project will be maintained.

Evaluation of the Intervention

The PDSA framework was used to test for changes in food insecurity screening and referrals. Data from the recent SSC audit for APPs served as the baseline for food insecurity screening pre-intervention. Patient charts were evaluated post-intervention for documentation of food insecurity screening and other variables (screening results, whether food resources were provided, referrals made to Social Work). This occurred on an ongoing basis beginning in February to March 2021.

A pre-post retrospective survey with six questions/statements, utilizing a Likert scale, was used to measure providers' perceptions on food insecurity screening and their confidence in screening (Figure 2). This survey was adapted from a tool used by another large medical system in the Pacific Northwest, which includes questions regarding confidence and competence in screening and addressing positive screens. A pre-post retrospective survey allows for anonymity and is a valid tool to use to assess knowledge, beliefs, and attitudes before and after the education session. The survey was administered through Qualtrics in February 2021.

Process and Outcomes Measures

This project had access to and recorded specific health information, but did not record patient identifiers. To ensure the accuracy of data collection and safety of protected health information, patient charts were coded in Microsoft Excel.

Improving Food Insecurity Screening and Referrals

A total of 160 patient charts were reviewed for documentation of food insecurity screening between February and March 2021. Pre- and post-intervention food insecurity screening rates were compared for changes. Data on the proportion of families given food resources and/or referred to Social Work were also collected. Not all patients who screened positive for food insecurity wanted help, and this data provided valuable information on acceptance of assistance with food-related needs.

Improving Patient and Family-Centered Care

Disadvantaged groups including ethnic minorities, low-income (e.g. Medicaid), and households with persons with disabilities are more likely to experience food insecurity. Those that screened positive, but were not eligible for government benefits, were connected to community food resources.

Improving Provider Confidence

Nurse practitioners were surveyed for confidence and competence in screening using the pre-post retrospective Qualtrics survey. This occurred once in February 2021 after the initial education/training presentation, and revealed changes in provider confidence with the availability of the HVS and food resources SmartPhrases. Individual feedback provided information contextual elements that contributed to the success, failure, efficiency, and of the intervention.

Ethical Considerations

This project had potential ethical considerations. No individual identifiers were recorded, and careful and proper use of all patient information was in accordance with the Health

Insurance Portability and Accountability Act of 1996 (HIPPA). Ethical dilemmas may have risen in certain situations where assistance with food-related needs is denied. It was with the providers' judgement and their relationship with the family to pursue any issues further, while maintaining the ethical principles of beneficence and respect for patient autonomy. The Institutional Review Board deemed this work as quality improvement and no further action was needed. There were no conflicts of interest to declare.

Projected Costs

Costs for executing this project were minimal. Implementation of the screening tool did not require additional staff or certification. Training was minimal; HVS use and associated SmartPhrase template was presented in a 10-minute session before starting the intervention. The standardized, more efficient food insecurity screening system did not create time or administrative burden.

Project Implementation

Evolution of Project and Modifications

The intervention was implemented beginning February 2, 2021 on an ongoing basis, immediately following the SSC monthly meeting. A brief presentation on food insecurity and national screening recommendations, followed by project goals, interventions (HVS tool, SmartPhrases, government/community food resources), and data collection was given during this meeting. The original plan was to duplicate the methods conducted by the SSC Discipline Director for the APP audit (which provided the pre-intervention data and impetus for this project), and review only a set number of five random charts per APP at each of the SSC. However, this method did not adequately capture the volume of patients seen by each APP. One

provider had not seen enough patients in the month that was planned for chart reviews. Thus, data collection focused on reviewing a specific number of charts rather than a set number of charts for each provider.

Patient loads varied and determined the number of patient charts that were reviewed for each provider. A power analysis was conducted with the conservative expectation of at least a 10% improvement in screening rates. Assuming alpha = 0.05 and power = 0.8, it was determined that 160 charts would need to be reviewed to detect a 10% difference in proportion. The same proportion (63%) of patient charts between February 3-March 5, 2021 were reviewed for each provider, for a total of 160 charts that were included in the post-intervention analysis. Documentation that screening was completed was the primary data collected and the outcome measure. The following information was also collected from each chart and recorded: screening results, whether food resources were provided, if families were connected to Social Work, and any related provider/other miscellaneous notes. Patient charts were coded in Microsoft Excel (as opposed to Redcap) and anonymized to protect patient information. A One-Sample Test of Proportion was conducted to compare the observed proportion in screening (88%; sample size: 160) to the null hypothesis value (67%).

The pre-post retrospective survey was administered directly after the February SSC APP presentation and instructions on how to complete the survey were provided. A secure survey link to Qualtrics was sent via email to each of the participating APPs to complete anonymously. Reminder emails were sent periodically between February and March to ensure that all six providers completed the survey. Additionally, the first three survey questions were modified to be prefaced with “I believe” or “I feel.”

Missing Data or Information

Four of the six providers completed the Qualtrics survey (Figure 3). Two of the surveys received were incomplete and were not included in the key findings. Survey anonymity prevented any follow-up requests for providers to retake incomplete surveys.

Key Findings

Improving Food Insecurity Screening

Eighty-eight percent of the charts (141 of 160 charts) indicated that screening was completed. According to the One-Sample Test of Proportion, this is significantly different from the pre-intervention screening rate ($p<0.0001$; z-statistic: 5.649), and falls within the 95% confidence interval (81.93% - 92.60%). While the majority of patients were screened using the adapted HVS SmartPhrase tool, 18 of the 141 charts did not clearly identify what specific screening tool was used, as patient responses specifically to the HVS questions were not documented within the chart notes. For two of the 18 charts, the families were identified as food insecure without showing documented use of the HVS SmartPhrase. These inconsistencies in charting may limit a full understanding the impact of the screening intervention.

Referrals/Improving Patient and Family-Centered Care

Approximately 10% of patients screened (14 of 141) reported food insecurity. Five of the 14 families were given either food resources only (n=3) or were given food resources and connected to Social Work (n=2). Conversely, four of the 14 families declined (and thus were not given) food resources because they already received food supports, as documented by the AAPs. One of the 14 families declined food resources and referral, reporting a previous negative experience with Social Work. Chart notes for four of the 14 families (including the two families

mentioned in the section above) did not document whether food resources were given and/or if the families were connected with Social Work, or if food supports were declined by the families. Per the APPs notes, these four families were either in the process of applying for government benefits, already receiving government benefits and using local food banks (or not using local food banks), or in need of more formal evaluations indicating food needs before they can apply for government benefits.

Two families were given food supports despite positive food statuses (i.e. negative food insecurity screen), including information on local and government food resources, but not referrals to Social Work. The parent of one these families reported they were ineligible for government benefits, but wanted additional food support. The caregiver of the other family wanted more information regarding applying for other government benefits to supplement their foster care subsidies. A total of 33 chart notes, overall, did not document whether food resources were provided or if the families were connected with Social Work.

Improving Provider Confidence

The pre-post retrospective Qualtrics survey revealed minimal changes in providers' perceptions on food insecurity and screening, improvements in comfort surrounding conversations about food insecurity, and increased provider confidence in helping families that are food insecure (Figure 3). The APPs were divided in their belief that food insecurity is a medical rather than a social problem. Most APPs maintained the same answer both before and after the education and training presentation, except for one APP whose answer changed only minimally from somewhat agree to strongly agree that food insecurity is a medical problem. All APPs agreed that food insecurity is prevalent and important to screen for, and each APP

maintained the same answer both before and after the education/training presentation. With regard to providers' perceptions about patient comfort in talking about food insecurity, before the presentation, most APPs felt that patients were neither comfortable or uncomfortable having that conversation. After the presentation, two APPs somewhat agreed that patients would be comfortable. One APP maintained their position and strongly disagreed that patients would be comfortable. Compared to providers' perceptions about patient comfort, before the presentation, the APPs were either neutral or somewhat/very comfortable themselves in having a conversation about food insecurity with patients, and also confident in helping food insecure patients. After the presentation, all APPs were somewhat or very comfortable and confident with both activities.

Project Outcomes

Observed Findings Compared to the Literature

Improved Food Insecurity Screening

We met the first aim of this project, which was to improve screening rates and identification of food insecure families across the six multidisciplinary SSC. A screening rate of 88% post-intervention was observed, and this is consistent with studies that have found improvements in food insecurity screening through the use of similar standardized tools and processes (Palakshappa, Vasan, et al., 2017). Most of these studies have also been done in settings in which a formal screening process was not previously in place (Palakshappa, Vasan, et al., 2017).

The APPs screened patients 88% of the time, but it's difficult to ascertain the level of improvement achieved since the methods for data collection needed to be changed during the project. The main issue was the small sample size (n=18) used in the pre-intervention, and the

uncertainty in how representative that small size is of the SSC (i.e. how good of an estimate is the 67% pre-intervention screening rate). With this important caveat in mind, only limited comparisons can be made between pre- and post-intervention screening rates; The rate appears to have increased, although this is measured with uncertainty. Nonetheless, an 88% screening rate indicates movement in the right direction, and approaches the goal of 90-100% screening.

Food insecurity screening was improved, but the proportion of food insecure families identified (10%) was surprisingly less than expected compared to studies, which often report greater food insecurity for households with children (Bottino et al., 2017; Coleman-Jensen et al., 2020; Cullen et al., 2019; Force, 2018; Palakshappa et al., 2020), and especially those with children with disabilities (Park et al., 2020; Rose-Jacobs et al., 2016; Schwartz et al., 2019). While the prevalence of food insecurity in any given setting varies largely and depends on a number of factors, including demographic (i.e. age, sex, socioeconomic status, ethnicity) and geographic factors (Barnidge et al., 2017; Bottino et al., 2017; Cullen et al., 2019), the 10% observed here was even lower than the overall prevalence of food insecure households both nationally and in Oregon (Coleman-Jensen et al., 2020; Force, 2018). Furthermore, with the current COVID-19 pandemic, food insecurity would be expected to be greater than in previous years, which has increased nationwide from 1 in 8 to more than 1 in 4 children (Coleman-Jensen et al., 2020; Force, 2018; Palakshappa et al., 2020; Tester et al., 2020).

The lower prevalence of food insecurity at the SSC may potentially be due to inaccurate disclosure and a number of inhibiting factors (Barnidge et al., 2017; Cullen et al., 2019; De Marchis et al., 2019; Knowles et al., 2018; Palakshappa, Doupnik, et al., 2017; Palakshappa et al., 2020). As Barnidge et al. (2017) found, nearly 20% parents/caregivers reported they would

be somewhat or very uncomfortable talking to a healthcare provider about food needs, and the odds were greater among parents/caregivers reporting household food insecurity. Caregivers that perceive "struggling to feed their family as a personal obligation" may not think to ask healthcare providers for assistance or that they would be able to help (Barnidge et al., 2017). In Bottino et al. (2017), incorporating "a menu offering food-assistance referrals" within the screening questionnaire "identified [15% more] families that otherwise did not report food insecurity on a standard screen" (p. 497). Another reason could be that the pandemic has increased availability of resources leading more people to access resources, thus resulting in overall lower levels of food insecurity. Finally, the limited time frame for data collection could have contributed to the lower food insecurity rates at the SSC.

In this project, the APPs were instructed to offer resources to families after reporting food insecurity. Interestingly, two families were given information on food resources despite a negative screen. It would be important to clarify the manner in which the resources were offered (i.e. before or after screening), or perhaps requested by the families, to identify methods that could improve the screening and referral process.

Improved Patient and Family-Centered Care

We met the second aim of this project, which was to improve assessment of food insecure families and the provision of food resources, including connections to Social Work. Five of the 14 families that reported food insecurity received a referral to Social Work and/or support in accessing food resources. Although pre-intervention data is unavailable for comparison, given the clinics' prior lack of a standardized screening and referral system, this is presumed to be an

improvement that is directly associated with the providers having better knowledge of the resources available.

Nearly 4% of food insecure families declined food resources because they already receive supports and one food insecure family declined food resources because of their prior negative experiences with Social Work. This reflects critical studies demonstrating that some families continue to experience food insecurity despite receiving food support and/or participating in federal nutrition programs such as SNAP, WIC, and the National School Lunch and Summer Meals Programs (Adams et al., 2017; Barnidge et al., 2017; Coleman-Jensen, Rabbitt, Gregory, & Singh, 2015). In addition, the two families that were given information on food resources despite a negative screen highlight the fact that not all families in need will screen positive. In Bottino et al. (2017), approximately 14.4% of food insecure caregivers did not accept food-assistance referrals, whereas 14.7% of caregivers accepted food-assistance referrals, but did not report food insecurity. So, it is important to remember that food insecurity status, or whether or not a family accepts nutrition support, may not represent their food situation at home with 100% accuracy. As such, how the screen is set up and conduced (i.e. the manner in which the questions and resources are presented) may influence detection of the patients and families identified with food needs, who are willing to receive help.

Improved Provider Confidence

We met the third aim of this project, which was to improve provider confidence in screening for food insecurity and addressing positive screens. Provider discomfort in discussing food insecurity due to uncertainty regarding local food safety net resources is a strong underlying factor for poor screening levels (Barnidge et al., 2017; De Marchis et al., 2019; Makelarski et al.,

2017; Palakshappa, Vasan, et al., 2017). The increase in provider comfort and confidence following the education and training intervention (Figure 3), parallel qualitative study data showing effective use of such activities to implement food insecurity improvement interventions (Barnidge et al., 2017; De Marchis et al., 2019). Moreover, these results show that addressing gaps in knowledge is, in part, necessary to improving screening rates. Providers' perception of patients' comfort level in talking about food insecurity changed only minimally with the intervention, suggesting it was not a barrier to screening.

Practice Implications and Recommendations

Practice-related Implications

A number of practice implications related to food insecurity and improved provider readiness to screen and intervene resulted from this quality improvement project. Understanding the impact of social determinants of health, such as food insecurity, and having actionable methods to address them allows providers to better meet patients' health needs. In this project, the APPs became more aware of their patients experiencing food insecurity and therefore, more aware of their actual and potential health outcomes. The increase in provider comfort and confidence also led to an increase in the number of patients that were connected to appropriate resources, which may thwart the impact of the lack of food and hunger, issues that are especially critical in these medically fragile children.

Recommendations

Usefulness and Sustainability

The interventions implemented in this project have proven useful, and the SSC currently have a system in place to ensure that they are established into the clinic workflow and intake

procedures long-term. However, this work is far from complete. More work is needed to achieve a 100% screening rate. The use of run charts or pareto charts, and screening more patients, would give us a better representation of the prevalence of food insecure families and also be helpful in determining the effectiveness of the interventions over extended periods of time (i.e. if screening rates continue to increase). Additionally, more PDSA cycles are recommended to identify barriers and determine what is causing the most issue with screening and/or referrals, and if changes need to be made. One PDSA cycle can assess if having parents complete the survey anonymously would help to improve screening rates. Another cycle would be to examine how integrating some food resources information as part of the survey influences disclosure and the proportion of food insecure families identified.

The SSC are audited biannually for specific metrics related to APP clinical performance, including food insecurity screening rates, and other opportunities for practice improvement. Continuing this audit and regular evaluations of screening rates, along with follow-up SSC APP meetings to collectively assess APP performance, are critical to sustainability of the interventions implemented. These activities will serve as reminders for providers to prioritize food insecurity screening and referrals.

Increasing Influence

Results of this project will potentially lead to the roll-out of the intervention to include other providers, and also inform and guide future quality improvement initiatives to improve food insecurity screening at the SSC. Engaging with other providers and colleagues at the SSC, and getting them on board to approach food insecurity with more of an interdisciplinary lens and collaborative effort will be critical. Ultimately, engaging with the community and developing

partnerships with local organizations will propel this project forward by bridging the connection between families and nutrition resources, and making the referral process more successful.

Summary and Next Steps

The longitudinal nature of routine health supervision and wide range of topics discussed makes visits to the SSC ideal for both starting and continuing dialogues with families to address social determinants of health and other issues such as food insecurity. Not only did this project establish a standardized food insecurity screening and referral process, it set 88% as the standard rate of screening, which did not previously exist at the SSC. Improvements were observed in screening and referral rates, identification of food insecure families, and in provider confidence in addressing food insecurity. However, although screening is important, it is only one component of addressing food insecurity, and a number of existing barriers prevented a 100% screening rates. Identifying these barriers will be critical in future work.

Next steps should focus on improving the screening and referral process, as well as on data collection. In order to address the question regarding accuracy in the proportion of food insecure families identified here, work is needed reduce stigma and improve the confidence patients and families have in reaching out to their healthcare providers for help. First, this can include updating the screening process so that parents/caregivers may complete the (electronic or paper-based) food insecurity survey anonymously and ahead of their child's visit. Second, integrating a list of food resources within the survey so that parents/caregivers may request additional information, regardless of their family food status, would help to facilitate capture of families with food needs, but that might not perceive or report themselves as food insecure. Work is needed to determine if the existing resources available are sufficient to meet the needs of

the SCC patients and families. Regular follow-up of families to assess for changes in food status will ensure that families in need are not missed, and provide them with reassurance that their healthcare provider is a source of help. Additionally, inviting feedback from families and having their input is also important. Future work could include creating a survey that asks families what they found most helpful about the screening and referral process, and then integrating that feedback into the quality improvement activities. Lastly, collecting patient demographics and information on other risk factors could provide better insight on the groups that are most impacted by food insecurity. Although the intention was not to measure prevalence of food insecurity at these clinics, further exploration in future PDSA cycles is merited as this information may impact future interventions.

Together our results emphasize the complexity and barriers to addressing food insecurity. While screening is important and definitely helps, it is not the only issue; Screening and referrals are only the tip of the iceberg, and they don't remove the other dimensions that influence food insecurity. An important takeaway is that we need to be more diligent about working towards addressing social determinants of health systemically, and dismantling the structural issues that contribute to health inequities.

Figure 1

Adapted Hunger Vital Sign Questionnaire

Food Questionnaire			
Our goal is to provide the best possible care for your child and family. Food is important to health. We would like to make sure you have enough food and the right types of food, and that you know all the resources that are available to you for your food needs. Many of these resources are **free of charge**.			
Please answer all of the following:			
Within the past 12 months, we worried whether our food would run out before we got money to buy more.	*Often true*	*Sometimes true*	*Never true*
Within the past 12 months, the food we bought just didn't last and we didn't have enough money to get more.	*Often true*	*Sometimes true*	*Never true*
If you answered "often true" or "sometimes true," would you like help?		*Yes*	*No*

Note. This figure illustrates the adapted HVS questionnaire (Likert version) that was used to create the HVS SmartPhrase tool. It includes statements on the purpose of screening and a question to determine if families want assistance with their food needs.

Figure 2

Food Insecurity Screening Provider Confidence Survey

Provider Confidence Survey

Thank you for attending the food insecurity training. Your feedback about screening and referral is important, so please take a moment to fill out this survey. Each question will ask you to rate a statement based on your experience **before** AND **after** the training. Please provide two answers for each statement.

Please rate the following answers based on your experience **before** and **after** the training today:
(1 = Strongly disagree, 2 = Somewhat disagree, 3 = Neither agree nor disagree, 4 = Somewhat agree, 5 = Strongly agree)

1. I believe food security is a medical issue rather than a social problem.

BEFORE the training:	**AFTER** the training:
Strongly disagree 1 2 3 4 5 *Strongly agree*	*Strongly disagree* 1 2 3 4 5 *Strongly agree*

2. I feel food insecurity is common and important enough that it is worth taking the time to screen.

BEFORE the training:	**AFTER** the training:
Strongly disagree 1 2 3 4 5 *Strongly agree*	*Strongly disagree* 1 2 3 4 5 *Strongly agree*

3. I feel most patients will be comfortable talking about food security.

BEFORE the training:	**AFTER** the training:
Strongly disagree 1 2 3 4 5 *Strongly agree*	*Strongly disagree* 1 2 3 4 5 *Strongly agree*

4. am comfortable having a conversation about food security with patients.

BEFORE the training:	**AFTER** the training:
Strongly disagree 1 2 3 4 5 *Strongly agree*	*Strongly disagree* 1 2 3 4 5 *Strongly agree*

5. I am confident I have the knowledge and tools to help patients with food security.

BEFORE the training:	**AFTER** the training:
Strongly disagree 1 2 3 4 5 *Strongly agree*	*Strongly disagree* 1 2 3 4 5 *Strongly agree*

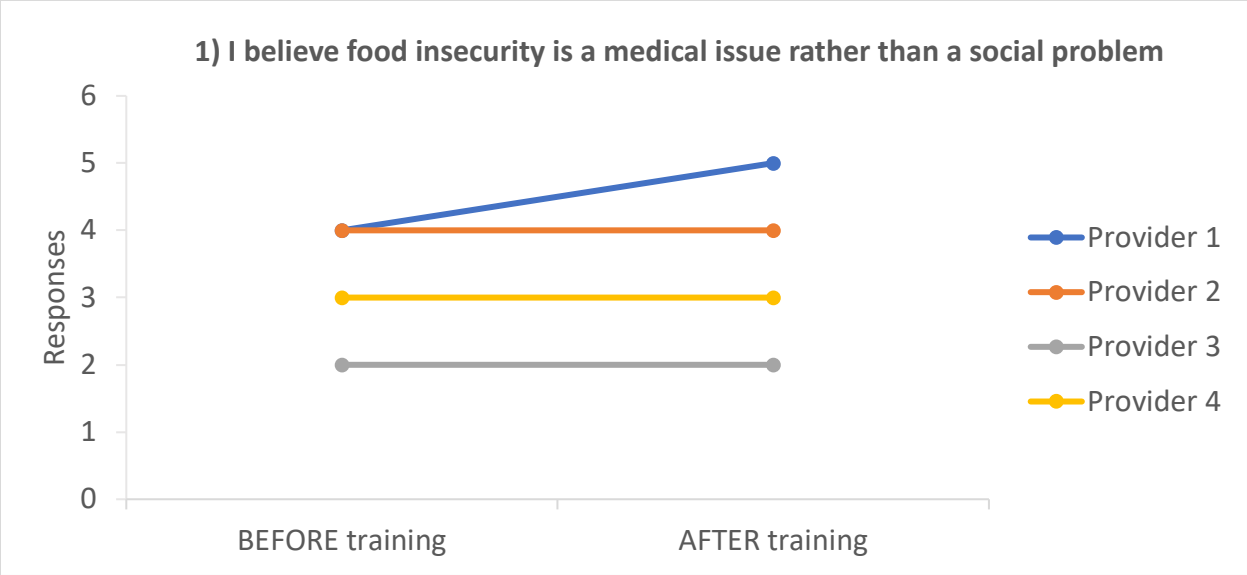
6. General comments about this workshop and/or food insecurity screening.

Note. This figure illustrates the five questions that were included in the pre-post retrospective Qualtrics survey that assess for knowledge, beliefs, and attitudes about food insecurity, before and after the education session. Responses (y-axis) represent a Likert scale: 1 = strongly disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, 5 = strongly agree.

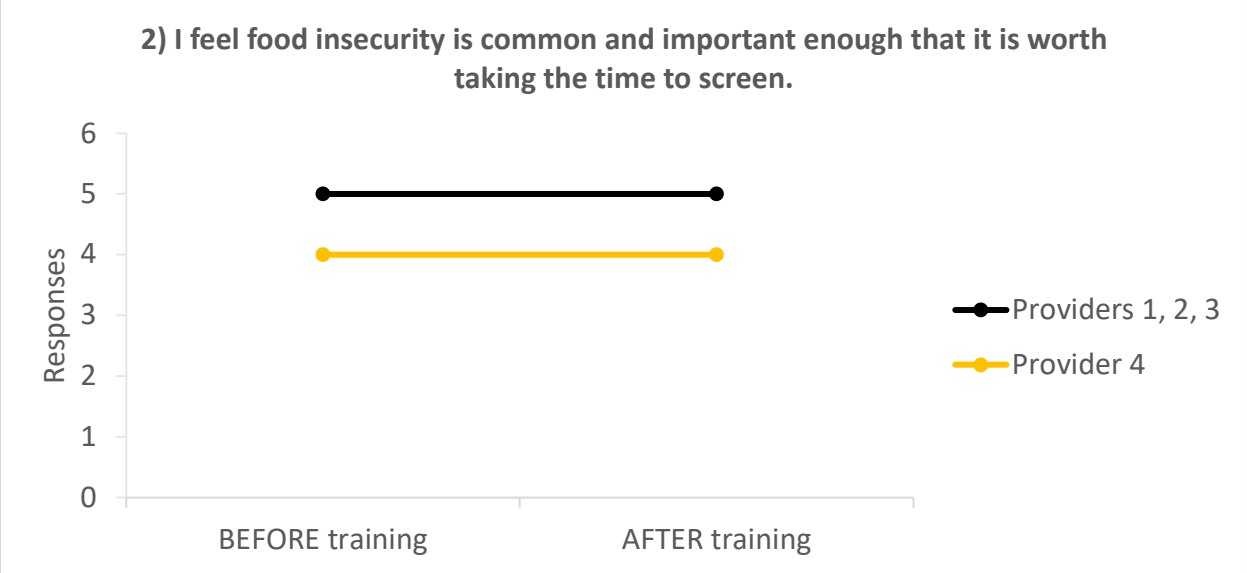
Figure 3

Provider Confidence Survey Results

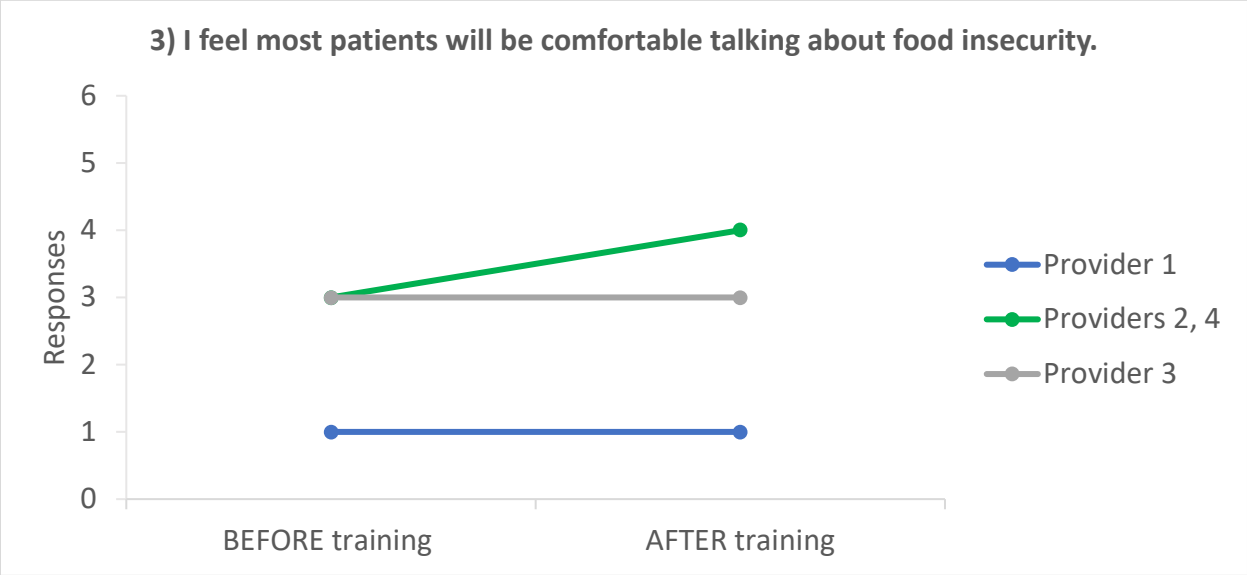
A



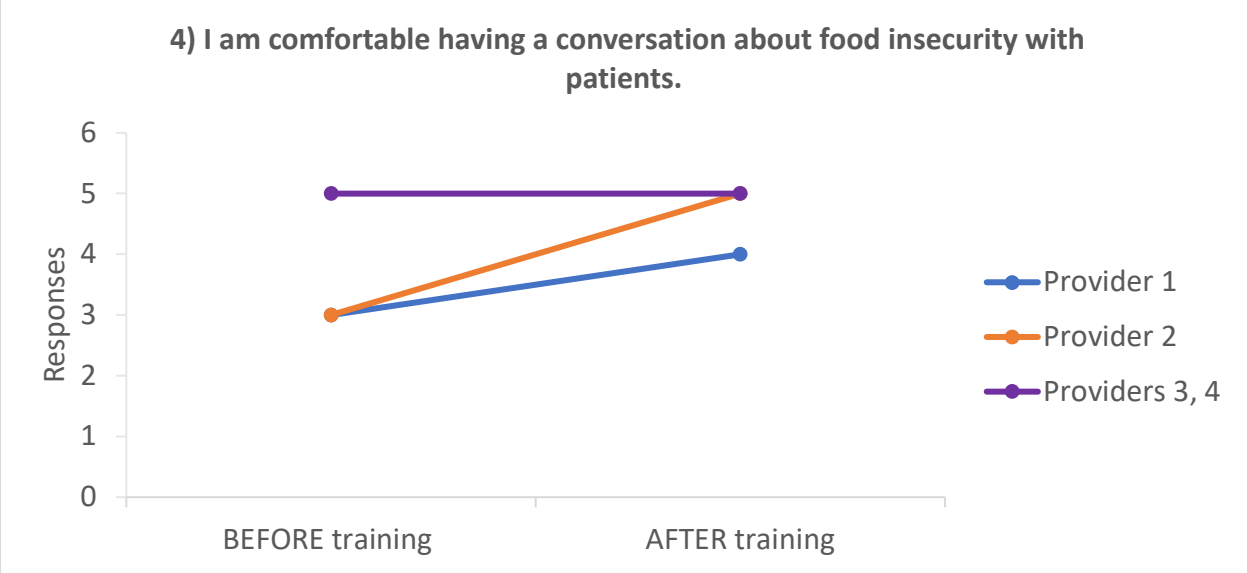
B



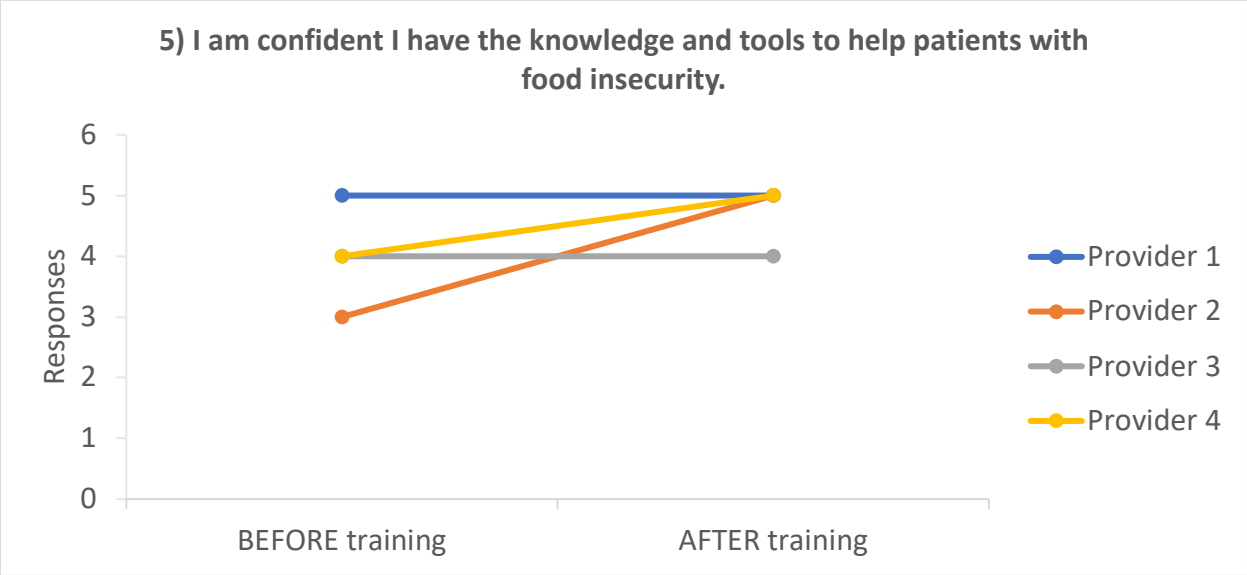
C


3) I feel most patients will be comfortable talking about food insecurity.
Responses
6
5
4
3
2
1
0
BEFORE training
AFTER training
Provider 1
Providers 2, 4
Provider 3

D


4) I am comfortable having a conversation about food insecurity with patients.
Responses
6
5
4
3
2
1
0
BEFORE training
AFTER training
Provider 1
Provider 2
Providers 3, 4

E



Note. This figure illustrates the providers' responses to the five pre-post retrospective Qualtrics survey questions that assess for knowledge, beliefs, and attitudes about food insecurity, before and after the education session. Responses (y-axis) represent a Likert scale: 1 = strongly disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, 5 = strongly agree.

Appendix A

Validated Food Insecurity Screening Tools

Screening Tool	Question and Answer	Sensitivity	Specificity
1-item screener in SEEK (Safe Environment for Every Kid) Screener (Lane et al., 2014)	"In the last year, did you worry that your food would run out before you got money or food stamps to buy more?" *Yes, No*	59%	87%
1-item screener (Kleinman et al., 2007)	"In the past month, was there any day when you or anyone in your family went hungry because you did not have enough money for food?" *Yes, No*	83%	80%
2-item Hunger Vital Sign (Hager et al., 2010)	"Within the past 12 months, we worried whether our food would run out before we got money to buy more." "Within the past 12 months, the food we bought just didn't last and we didn't have enough money to get more." *Often true, sometimes true, never true*	89-97%	83-84%

Appendix B

Tools to Screen for Social Determinants of Health and Other Risk Factors

Screening Tool	Description
Income, Housing, Education, Legal Status, Literacy, and Personal Safety (IHELLP) (Kenyon, Sandel, Silverstein, Shakir, & Zuckerman, 2007)	Suggested screening questions related to Income, Housing, Education, Legal Status, Literacy, and Personal Safety.
Well Child Care, Evaluation, Community Resources, Advocacy, Referral, Education Survey Instrument (WE CARE) (Garg, Toy, Tripodis, Silverstein, & Freeman, 2015)	Survey instrument to screen for family psychosocial problems including education, employment, childcare, housing, food security, and utilities.
Survey of Well-being of Young Children (SWYC) (Sheldrick & Perrin, 2013)	Screening instrument includes sections on developmental milestones, behavioral/emotional development, and family risk factors such as substance abuse.

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