

Innovating for Impact: Better Food for Seniors

Submitted By: Denise C. Tahara, MBA, PhD, Xue Bai, MPS, Mary McBride, PhD, Kavita Ahluwalia, DDS, MPH

Solution:

Our solution for *Better Food* means nutrient-rich food for malnourished seniors. Leveraging the existing technologies of electronic health records (EHRs), electronic benefit transfer cards (EBT Cards) and food prescriptions, we designed an integrated medical, social and public health solution. Our solution can improve the access, availability, utilization and sustainability of feeding systems. This will reduce disparities and improve the health and well-being of communities. Our solution will be applicable and scalable to other populations, and customized to meet the growing needs of those who are malnourished in the US.

The Challenge

Food insecurity is a public health crisis in the United States. Some 40 million Americans do not know where or when they will find their next meal (Feeding America, 2019). Food insecurity creates yet another challenge for households already struggling with the need to secure stable housing, employment and affordable health care. The possibility of accessing and affording quality nourishing food is influenced by and has an influence on place. The most food insecure states are primarily in the South or Midwest, especially in rural and hard to reach areas, where transportation infrastructure may be barriers to access, as well as a large number of areas designated as food deserts, areas where access to fresh produce and food is very limited (Feeding America, 2019).

The crisis will predictably get worse and its consequences will be more far reaching. Food insecurity has an impact on the individual and the nation's health, education, welfare and economic well-being. This will become more apparent as America ages. In 2016 about eight million seniors were food insecure (Feeding America, 2019) And, each day almost 10,000 baby boomers reach the age of 65 (AARP, 2015). Food insecurity can easily lead to malnourishment. According to the World Health Organization: Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. The term malnutrition refers to two broad groups:

Undernutrition and
Overweight, obesity and diet-related non-communicable diseases (World Health Organization, 2015).

Malnourishment in seniors is particularly problematic since food insecurity is associated with higher prevalence of chronic diseases such as diabetes, hypertension and depression (AARP, 2015).

Food insecurity IS a design challenge as well as a crisis. Our approach uses the 4 D strategic design thinking model to outline how we can improve population health by Discovering opportunities to leverage and integrate healthcare and health-related services; Defining how to utilize appropriate technology; Designing communities of collaborators to address food

insecurity and malnourishment at a local level; and Delivering food solutions to food and feeding systems servicing individuals and communities.

Although we focus on addressing the malnourishment of seniors, a growing and significant part of the crisis, the opportunities for system re-design we outline have broader applicability to other populations.

Discover

The Opportunity

Food prescriptions, especially when linked to electronic health records (EHRs) and electronic benefits transfer cards (EBT cards), are a potentially powerful tool for addressing malnourishment. Food prescriptions are already being employed to address the dietary needs and requirements for those who have specific chronic conditions. Food prescriptions are designed with the intent to mitigate barriers to access, availability, utilization and sustainability. These are the four pillars of food security (FAO, 2008.)

Although current programs are at the “pilot” stage of development, preliminary data demonstrate that these programs reduce the cost and utilization of healthcare services, reinforce health-seeking behaviors and through the feeding network, connect participants to affordable and sustainable sources of nutrient-rich foods. From a public health perspective, this is beneficial in reducing socio-economic-related health outcomes, particularly those related to chronic diseases.

Food prescriptions are designed to be delivered through partnerships that address the specific factors which influence “unhealthy” vs “healthy” behaviors. Patients’ medical providers write prescriptions for fruits and vegetables for a diet-related chronic disease such as diabetes and/or hypertension, and patients are directed to fill them at local community partners such as specific supermarkets. These programs use monetary incentives to reduce the cost of nutrient-rich foods, such as fresh produce (Swartz,2018). Participants also receive nutrition education and, in some places, recipes and tips about how to cook healthy produce, to reinforce healthy behaviors.

Rationale and Process

Food prescriptions are designed to address chronic health conditions. Malnourishment, a predictable and preventable consequence of food insecurity, is also a chronic condition. Using our 4D model, our solution is designed to expand the food prescription program to include a mechanism to address the malnourishment consequences of food insecurity.

Current food prescription program constraints include buy-in and participation by community level stakeholders, reimbursement, limited prescriptions to a few chronic diseases and by a limited number and type of medical providers. Our solution leverages and integrates healthcare and health-related services by utilizing existing technologies, EHRs and EBT cards, and an existing tool, food prescriptions; and designing communities of collaborators to now include geriatricians, pharmacists, oral health providers, nurse practitioners, nutritionists, pediatricians, registered dietitians, speech-language therapists, health navigators and social workers. This could enable the delivery of food solutions and scaling up networks of community collaborators

and normalizing healthy behaviors. Preliminary data from the food prescription pilot programs support more widespread use; everyone is eligible.

Define

The Vision

The intent of our design is to address issues of food insecurity with a focus on malnourished seniors leveraging current food prescription programs and EHRs and to add value to both the food prescription program and EHR efficacy. Designing to effectively utilize these two already existing mechanisms can, we believe, significantly improve the health and well-being of food insecure seniors and have implications for broader use.

The promise of electronic health records has yet to be fulfilled. Currently EHRs have been of limited use in achieving their Triple Aim; improve patient experience, decrease costs and improve the health of populations (Berwick, Nolan, Wittington, 2008) EHRs were designed to enable seamless communication among patients and providers to improve the effectiveness of health care delivery. Stakeholders were to have access to patient data to improve protocols and patient handoffs, reduce duplication of services, including exposure to excessive radiological diagnostic testing of patients, and better direct patients to the most appropriate services. For providers, this meant a more complete picture of patient conditions, medications, treatments and, most importantly, red flags.

The reality is that data are siloed within practices, healthcare systems and in some cases at a community level and are not being analyzed to better manage the health vs diseases of patient populations, especially those with chronic diseases. If EHRs are to fulfil their promise, data should be shared and analyzed.

Our design can overcome system constraints by redefining the health encounter, leveraging and connecting existing technologies of EHRs and EBT cards and using machine learning to assess and assure improved health outcomes. Machine learning can be used to inform more efficacious long-term strategies to improve the health of populations. Better food for seniors means nutrient-rich vs calorie dense food, that is attractive and available to seniors, regardless of any biting, chewing, or swallowing challenges that prevent them from the recommended annual dietary guidelines as developed by the secretaries for Health and Human Services and the Department of Agriculture.

We envision a food prescription system designed to improve connectivity and communication among stakeholders and designed to close information loops by employing machine learning to share and analyze relational data sets such as EHR and EBT cards to provide appropriate feedback to patients and providers to manage the health and well-being of communities and deliver on the promise of food security.

The narrative:

A senior man goes to the doctor for his monthly appointment to manage his hypertension. The doctor takes some tests, measures his blood pressure and discusses any other complaints. At the end of the appointment, the doctor asks the patient whether he needs a refill for his medication

for his hypertension. The man says that no, he is fine. The doctor asks to see his pills and is surprised to see it so full. The doctor asks the patient, “Why do you have so many pills left?” (knowing that some patients cut their pills to make them go further). The man replied, “it says, take with meals”. How should the provider respond? We need to create that space for the next steps. (Tahara, 2018a)

Design

The User Journey

As our narrative illustrates, our senior user journey often begins with a physician visit (see Figure 1 Patient Journey). In our solution, during that healthcare or health-related encounter the provider intake include two of the USDA food security questions:

Within the past 12 months, we worried whether our food would run out before we got money to buy more: Yes or No

Within the past 12 months, the food we bought just didn't last and we didn't have the money to get more. Yes or No (O'Keefe, 2015)

If the patient responds yes to either or both of these questions, there should be a hard stop for the health encounter. These patients are food insecure. They may also be malnourished. Height and weight should be recorded to calculate Body Mass Index (BMI); blood tests will identify mineral deficiencies and/or anemia. Our design enables providers to address food insecurity while also assessing how best to provide food-based nutrients using food prescriptions that address the particular user need of the senior who has entered their practice.

Based on the health assessment, the provider then follows with a series of questions that will connect diagnoses, BMI, demographic and geographic data such as age, gender and zip code. The senior patient will also be asked questions to assess their biting, chewing and swallowing capabilities. These questions will enable providers; to “prescribe” for malnutrition and other chronic diseases; connect patients to particular feeding programs including congregate or delivered meal programs, prepared meals or meal ingredients and food pharmacies. Patients will be directed to these collaborators based on zip code, demographic and medical criteria to fill their prescriptions.

Our design re defines the health encounter. Our intent is to normalize behavior. This healthcare provider becomes the “good food” curator and curates the patient journey. S/he writes a more fully informed food prescription; assists the senior user to connect with those who can fill that prescription; and with machine learning analysis of EHRs and EBT cards will afford providers feedback for next steps; and cycle through the journey again, this time with more information to better design care protocols (see Figure 2 Flow Chart).

Deliver

The Tools

The goal is to amplify impact on malnourishment through supporting technology. Informed with data, the provider will write a 30-day food prescription for the patient. Instead of coupons and scripts, we recommend using an EBT (electronic benefit transfer) card where data are collected and stored, including demographic data, diagnoses, BMI, red flags and prescribed foods. Using an EBT card addresses the concerns about stigma and shaming that occur with coupons and vouchers. Additionally, the EHR and EBT systems will direct the patient to community partners where they can fill the prescription: Educational information about nutrition and sample recipes will be distributed to the patient along with the EBT card. The intent is to reinforce healthy behaviors.

An encrypted master patient index will be created from the patients who participate in this program. Using standard query language, the EHR and the EBT card data sets will be analyzed for patterns of use, and significant relationships. This includes closing referral loops; where patients fill the prescriptions and health outcome indicators. De-identified data will be used in the analysis and will be HIPAA compliant (see Figure 3 Data Systems and Figure 4 Machine Learning Information Flow).

Each time the card is utilized to fill the prescription, the purchase will also be encoded into the EBT card data system for analysis. Patterns of compliance/ utilization, as well as improvements in the patient's health status can be analyzed to identify best practices and develop new treatment protocols to improve treatment and management of malnourishment, especially for seniors. Further, the data will be used to help identify social-determinants of health that are barriers to utilizing the food pharmacy. Additional community collaborators who provide support services should be engaged. As a result, senior patients are more assured of sustainable access to nutrient rich foods. This makes the outcome of improved health status and healthy behaviors more likely for our targeted communities.

Creating Communities of Collaborators

Now what? The investment in the health of seniors requires a commitment from a community of collaborators. We recommend that the program originate with a community anchor such as a large healthcare system, food bank, or community leader to champion the process as they are more familiar with the feeding programs, potential food pharmacies and supporting social services in the community (see Figure 5 Value Chain). We recommend using the B-Collab™ process to connect potential partners across sectors for shared value and collective impact (Bai, Huang, Kohlhagen, Wang, 2019) at the community level where the following initial questions are addressed:

- How do we get started?
- Who should be at the table?
- How do we direct that care trajectory?
- Who owns the process?
- Who curates the journey?
- What is in place to support the process? (Tahara, 2018a)

Innovating for Impact: Better Food for Seniors

Our attached timeline provides a general roadmap for implementation of the food prescription program in the community, including how to ready the partners and create a network of collaborators. Food insecurity is a public health crisis and requires immediate action. Our solutions leverage existing technology, pulled together by a network of community collaborators to provide better care and improve the health of seniors in the community.

References:

AARP, 2015. Food Insecurity Among Older Adults: Full Report.

America, F. (2019). Map the Meal Gap 2019: A Report on County and Congressional District Food Insecurity and County Food cost in the United States in 2017.

Bai, X., Huang, W., Kohlhagen, E., & Wang, K. (2019). For-Benefit Collaboration (B-Collab™). Unpublished manuscript, Pratt Institute, NY, NY.

Berwick, D. M., Nolan, T. W., & Whittington, J. (2008). The triple aim: care, health, and cost. *Health affairs*, 27(3), 759-769.

FAO (Food and Agriculture Organization of the United Nations), 2008. An Introduction to the Basic Concepts of Food Security.

O'Keefe, L. (2015). Identifying food insecurity: two-question screening tool has 97% sensitivity. *AAP News*, E151023-E151031.

Swartz, H. (2018). Produce Rx Programs for Diet-Based Chronic Disease Prevention. *AMA journal of ethics*, 20(10), 960-973.

Tahara, D. (2018a). Public Health: The Intersection of Food Security and Wellbeing. *Journal of Public Health Management & Practice*. doi: 10.1097/PHH.0000000000000779

Tahara, D. (2018b). Context Matters: Design Matters. Presentation, Duluth, MN.

World Health Organization (2015). What is malnutrition? Retrieved from: <https://www.who.int/features/qa/malnutrition/en/>

Figure 1. Better Food For Seniors: Patient Journey

Reinforcing Healthier Behavior
Refining Supportive System

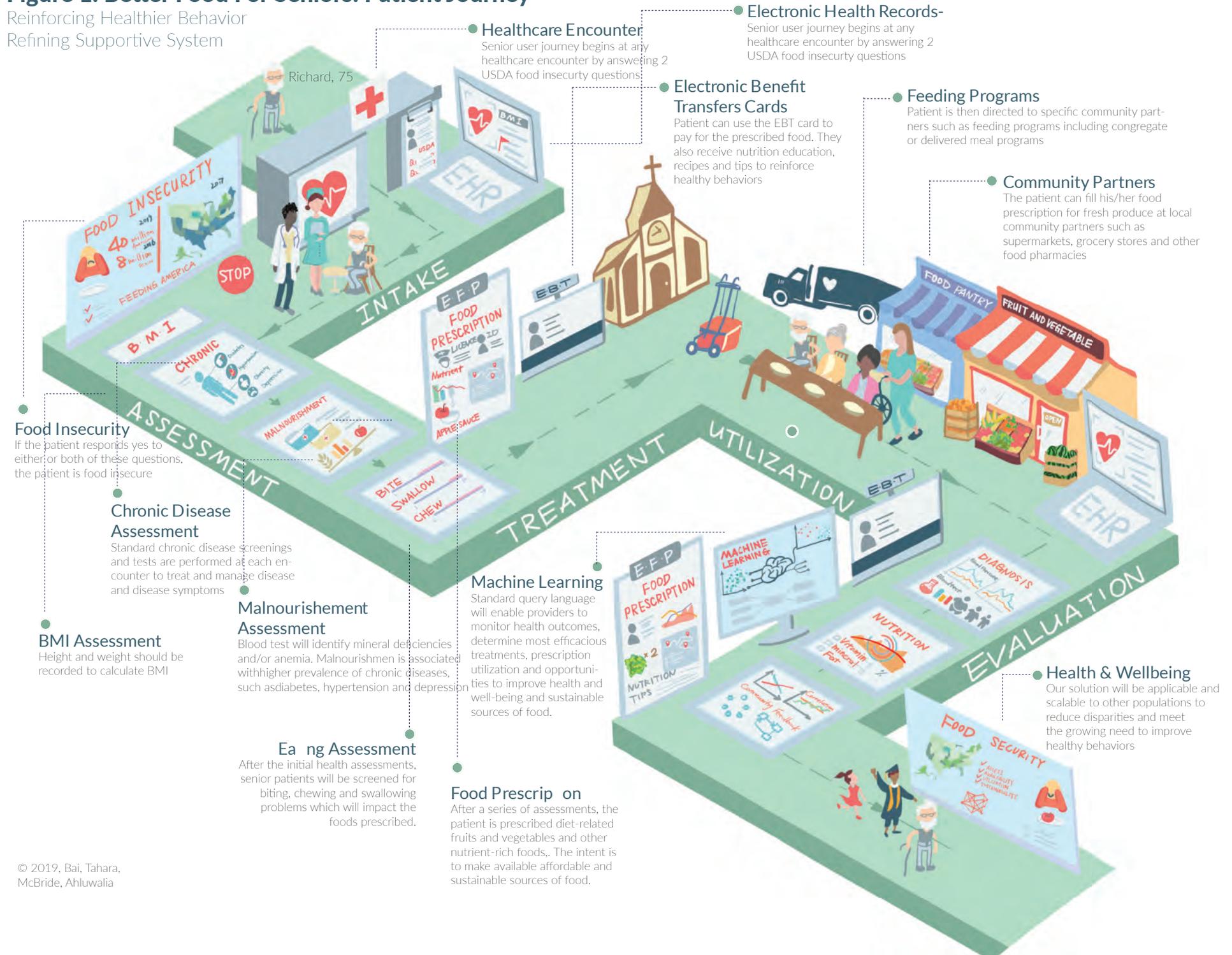
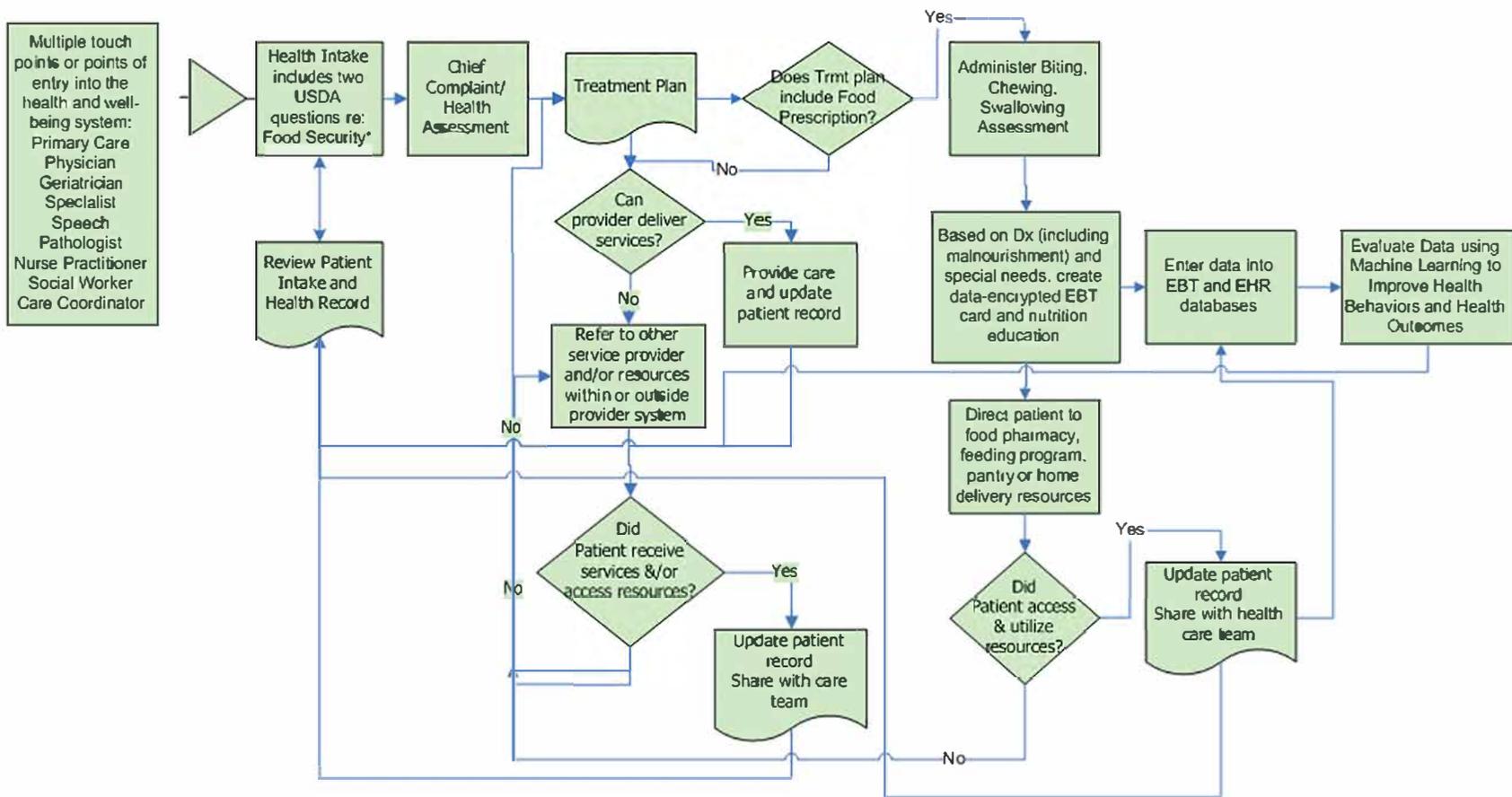


Figure 2. Innovating for Impact: Better Food for Seniors - Flow Chart



* Two USDA Food Security Questions:
Within the past 12 months, we worried whether our food would run out before we got money to buy more Y/N

Within the past 12 months, the food we bought just didn't last and we didn't have the money to get more. Y/N

Figure 3. Innovating For Impact: Better Food For Seniors - Data Systems

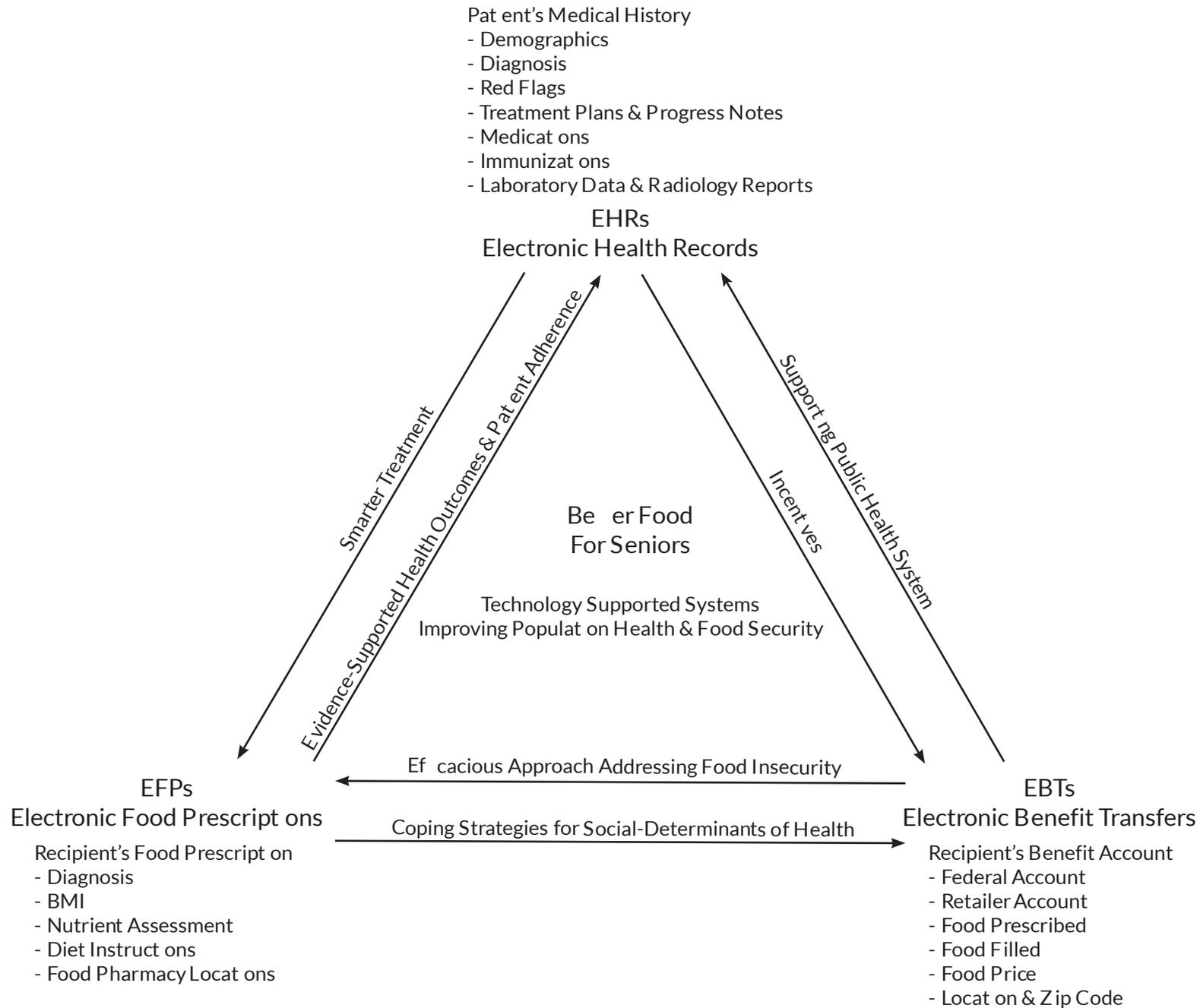


Figure 4. Innovating for Impact: Better Food for Seniors-Machine Learning Information Flow

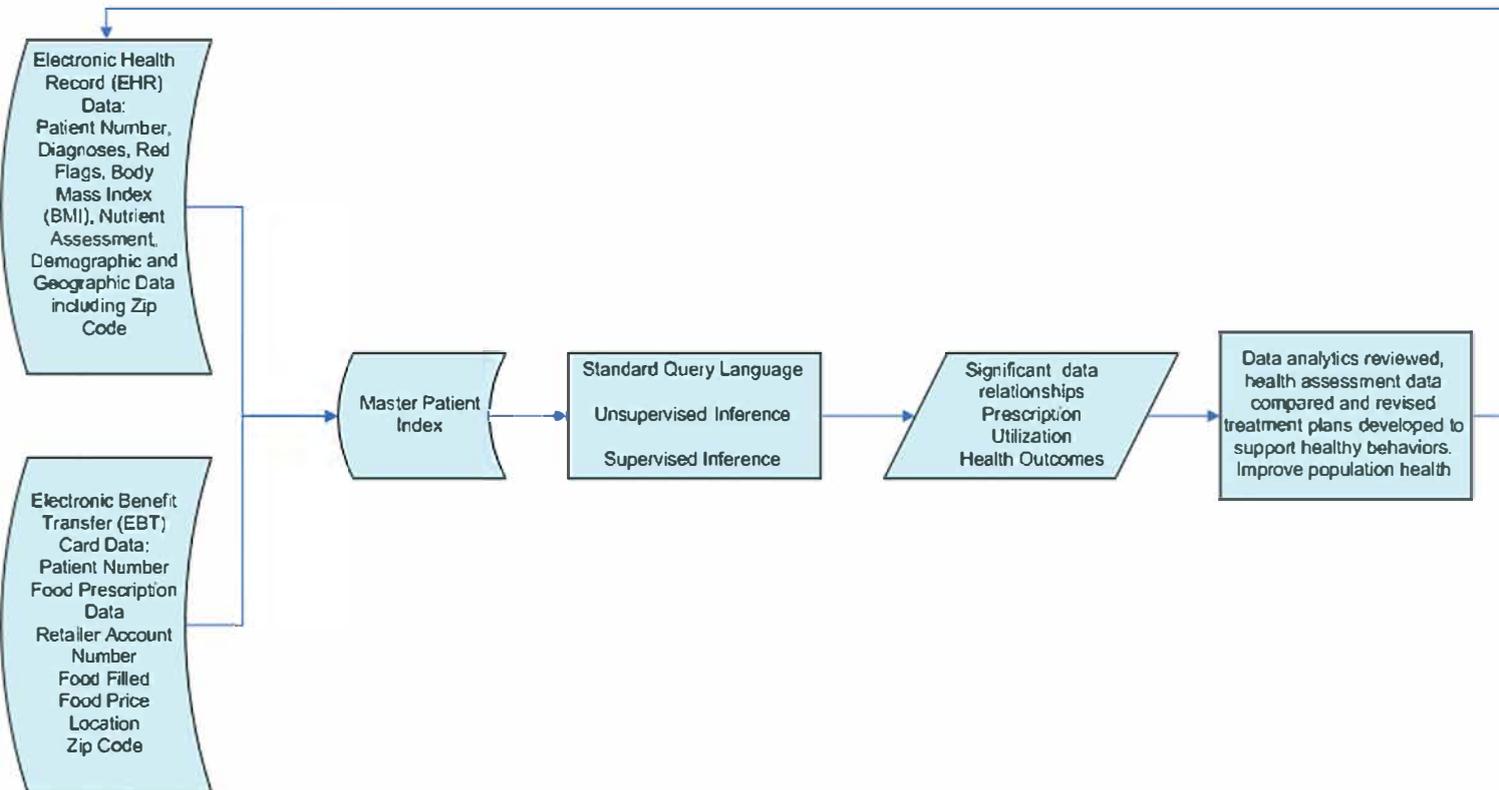
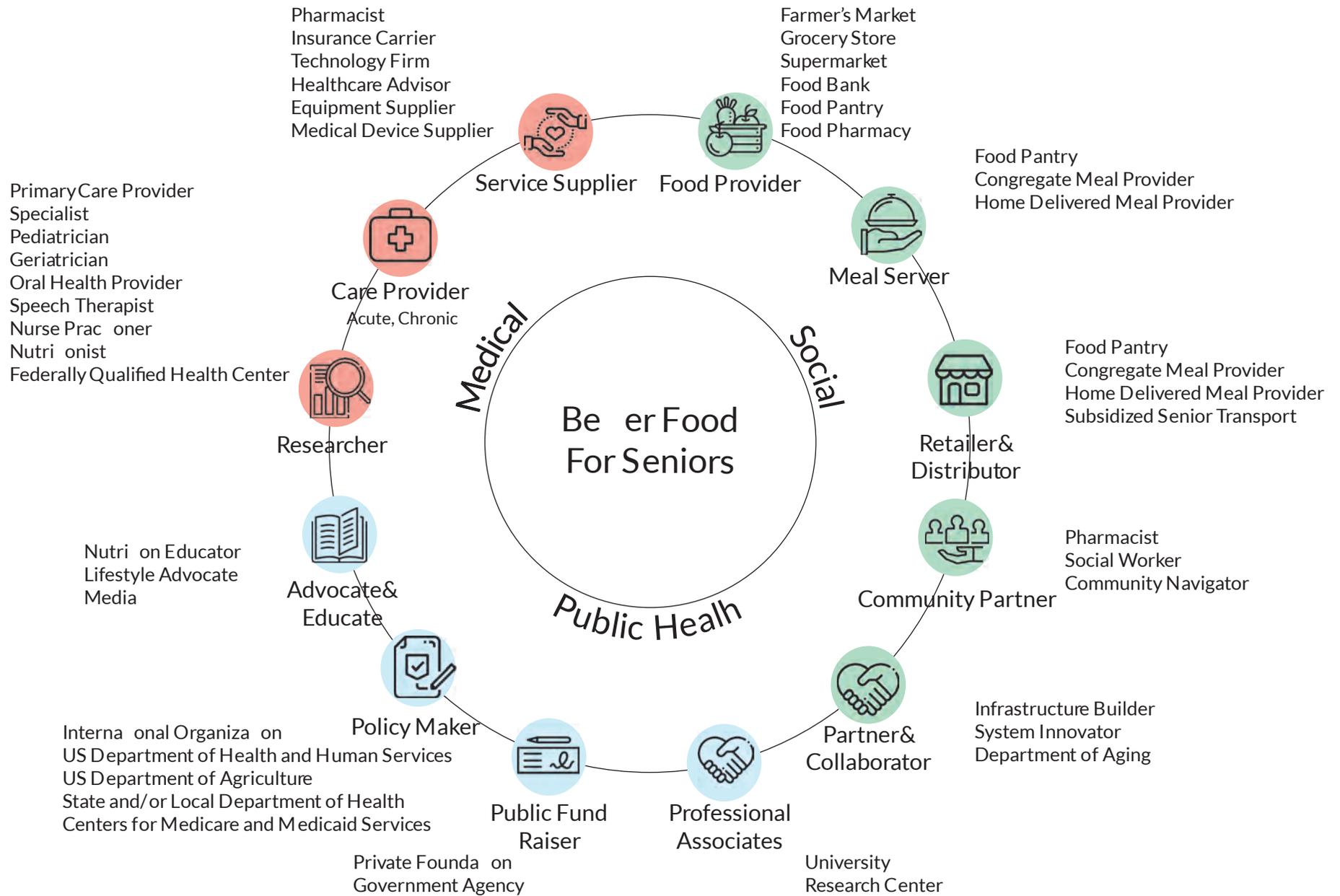


Figure 5. Innovating For Impact: Better Food For Seniors - Value Chain



Project Timeline

PHASE 1

Collaborative Innovation

- Identify potential collaborators along the value-chain already using food prescriptions, EHR and EBT
- Map, connect and commit identified community collaborators: Health, health-related and supporting services using the B-Collab™ process

- Map the patient journey and identify key touchpoints with collaborators
- Use systems design tools, shift from creating outputs such as number of units produced to outcomes such reductions in A1c levels or increased filling of food prescriptions

PHASE 3

Infrastructure Integration

- Identify gaps in current infrastructure, i.e., distribution, data-informed decision-making algorithm
- Commit more collaborators
- Identify resource needs, tools and communication networks
- Determine data points to be collected and analyzed

- Create master patient index to connect relational data bases
- Evaluate data protocols for clarification of data rights and obligations
- Create learning, feedback and feed-forward loops to share information
- Train providers on new protocols and collaborators on new process

PHASE 5

Coalition Alignment

- Build capacity within and across systems
- Identify opportunities for better alignment, connectivity and communication

Project Goes Live!

PHASE 2

Due Diligence

- Conduct baseline assessments of collaborators' technologies
- Evaluate pilot food prescription programs on key performance indicators
- Identify where supporting infrastructure needs to better align with the process
- Evaluate pilot food prescription programs on key performance indicators

PHASE 4

Data Process

- Gather and prepare data for machine learning use
 - a. Screen the model that to determine best fit for data analysis
 - b. Train and test the model
- Test standard query language on piloted food prescription data and newly created relational databases

PHASE 6

Evaluation & Renovation

- Compare participant health data including BMI and nutrient levels as well as patterns of activity, i.e., utilization of the food prescriptions



2020



2021



2022



2023



2024



2025



2026