



CARE PLANS

A Path to Driving Better Outcomes

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Executive Summary

A care plan is a synthesis of all plans of care produced by the patient and his or her providers to manage the patient's day-to-day health. It serves as a shared conceptual framework to guide all care team members. This article explores the history, current state, and opportunities for improvement of care plans.

Care plans began in the 31st century BC, when most of the care regimens provided to patients were focused on either external symptoms, or a magical basis. Between the 16th and 19th centuries, heavy scientific discovery lead to a transition of supernatural explanations to health as a natural state of the body. Throughout the 20th century, modern medicine developed a foothold in standard clinical practices as care plans entered the nursing field. The fields of case management, developmental psychology, life care planning, and others contributed to the evolution of care planning and its current components. Due to recent healthcare reforms in the 21st century, care plans have started to receive more focus, as government and private insurance companies now incentivize health outcomes and management of chronic health conditions.

Care plans are comprised of the universal components of

a health history, health concerns, goals, instructions and interventions, review, and the care team. While care plans share these components, they can address a multitude of content areas such as nutrition, physical activity, medication management, and more. Certain content areas are more important to some patients than others.

As care plans receive more focus from payers and practitioners, digital services that help with implementation have started to emerge. Some of these services are assessed based on patient and clinician needs, and the findings are discussed. Currently care plans face the barriers of: creation in isolation, miscommunication, episodic review, patient non-adherence, and issues with privacy and accuracy of information.

In consideration of our shifting healthcare system and the identified barriers, pathways to an improved care plan are proposed. These include care plan digitization, standardization of content, patient data ownership, patient empowerment, an intervention framework, and expansion of the care team. Priority is given to these pathways, and a call to action is made to patients, clinicians, designers and entrepreneurs, and policy makers.

Introduction

“Self-care in health is the new black. We’re digitally DIY’ing life, scheduling our own travel and booking restaurant tables, curating our photographs and trading stocks. People are morphing into health consumers, and that requires health engagement which means getting smart about our bodies, our selves, our numbers, and our treatment options. Care plans are an on-ramp to shared and sound decision-making for self-health.”

- Jane Sarasohn-Kahn, MA (Econ.), MHSAs

A care plan is a synthesis of all plans of care produced by the patient and his or her providers to manage that patient's health day to day. It serves as a conceptual framework shared by all care team members to guide an individual's care.^{1,2,3}

The care plan is designed to provide continuity of care, and help the patient better engage in self care activities to improve their health. A specific plan of care, usually created and administered by a medical provider, might relate to a specific episode or condition and makes up just one building block of a person's holistic care plan.^{1,2,3} These plans of care may have varying terminology across stakeholders, such as treatment plan (relating to medicine), support plans (relating to social care), intervention or management plans (used by nurses), advance care plans (for when the individual may have difficulties

communicating and interacting with others), among many others.

In recent history, care plans have been localized to paper formats in the nursing context. However, the HITECH Act of 2009 that incentivized adoption of electronic health records has paved the way for digitally recording care plans into EHR systems by a breadth of different care providers. Entry of care plans into EHRs means they are then potentially available to patients through connected patient portals. As of January 2015, CMS transitioned Medicare to the more quality-based practice of reimbursing for care management of eligible patients with 2 or more chronic conditions. Other private insurance companies are beginning to follow suit to prioritize consistent, preventative care facilitated by patient-accessible care plans.

Care Plan Components

Patient Summary			
Summarized history includes basic information such as demographics (name, age, contact info, ethnic or religious beliefs), health metrics (weight, blood pressure, etc), allergies, or medications and therapies. It can also contain past health history such as past hospitalizations. ^{1,8}			
Health Concerns	Goals	Instructions & Interventions	Review
These are the current problems in health. Identification of these concerns can involve reviewing symptoms, general health behaviors, and any social or environmental factors on health. Collection of vitals might also be involved in the identification of health concerns. ^{2,4,8}	Goals are used to measure progress. They give a care plan direction and are the first indicator of what path a patient is taking to manage their health concerns. Care plans are typically made up of a few high level goals that consist of many smaller short-term goals. ^{1,2}	Information or directions given to you and your other providers make up the instructions of your care plan. This can include how to care for a condition, what to do at home, when to call for help, or changes to the medication. Interventions are actions taken, most often by you, to work toward achieving care plan goals. This can include symptom and medication management, community/social services, and removal of barriers to success. ^{1,2,5}	You and your provider set a specific date and outcomes to evaluate the effectiveness of the care plan, and make adjustments where appropriate. ¹
Care Team			
Your care team is everyone who manages or provides care, including yourself. Medical practitioners, nurses, social workers, and caregivers are just a few examples. ^{2,7}			

Figure 1: Care Plan components derived from CMS's MU 2^{4,5}, the Coordinated Care Plan documentation from the OMA¹, the traditional nursing care plan structure³, and the Care Plan Glossary from the ONC's S&I Framework²

Care Plan Content

While a general consensus is being reached on the universal components of a care plan, the actual content that these components address is still largely unstandardized. In the future, there will be always-evolving care plan templates with evidence-based content for the full spectrum of human conditions. For now, we can categorize the areas of concern into commonly used categories.⁹

Nutrition

A nutrition plan must recognize the current problems in eating habits and consider chronic conditions/symptoms,

food preparation capabilities, and dietary restrictions of the individual. The outer aisles of the supermarket are where the healthiest foods are: greens, fruits, poultry, nuts, grains, and dairy. Fill up the cart. Meals at home and a brown bag lunch at work are more nutritious than eating out. Families who eat the evening meal together eat healthier.⁹



Physical Activity

Regular physical activity is especially important for those with conditions like diabetes, high blood pressure, or high cholesterol. The goal is to get active and STAY doing enjoyable and, therefore, sustainable activities. Exercising regularly can lower your blood glucose, blood pressure, and cholesterol levels, and even reduce stress. An increase

in light activity increases fitness, so fidget and putter and do housework. Make walking a daily habit — for your commute, errands, stairs, and fitness — and get that step count going up.⁹

Sleep

The amount of sleep a patient gets is a significant factor on their overall wellbeing. Healthy adults need 7-8 hours of sleep a day for optimal performance, and children and teens need more. Prolonged inadequate sleep can cause high blood pressure, heart attack, obesity, stroke, depression, mental impairment, and generally poor quality of life. Maintaining a consistent sleep schedule helps keep your cycles regular and promotes better quality sleep. Create a relaxing bedtime ritual and keep laptops out of the bedroom. Beds are for sex and rest. Recognizing problems with sleep behaviors and outlining the steps to improvement are an important part of the care plan.⁹

Mental Resilience

Management of stress and any mental, cognitive, or mood symptoms is another, very complex part of the care plan. Prolonged exposure to stress can be unhealthy, and cause or make it difficult to manage conditions like diabetes, high blood pressure, high cholesterol, and psychiatric illnesses. Chronic stress can negatively impact on your immune, digestive, renal (kidneys), and reproductive systems. It is essential to take the proper steps eliminate or cope with stressors in an effective way, as well as manage any symptoms of mental illness.⁹

Medication Management

Recognizing a need for change in the medication regimen allows for the creation of a treatment plan. It is beneficial to ensure adherence to the prescribed medication, as patients who stick to their medications have better outcomes. Quitting early means health suffers. It is important to ask and understand why a medication is necessary, how to properly take it, what side effects are causes for alarm, and who to talk to if issues arise.⁹

Sexual Health

Good health bolsters your sex life; your sex life bolsters your health. Regular sex — once a week or more — is associated with greater immunity, less stress, fewer heart attacks, longer life, and unleashes mood-boosting endorphins. If worries or physical challenges are hindering your enjoyment of sex, talk to your partner and possibly a doctor for reassurance and advice. To avoid HIV infection and sexually transmitted diseases (STDs), a condom is the first line of defense. It forms a barrier between the penis and anus, vagina, or mouth. Bodily fluids cannot get past it. For safer oral sex, there are dental dams.⁹

Cessation of Bad Habits

It's important to identify and recognize the impact of bad habits such as smoking, alcohol over consumption, substance use, and even consumption of harmful foods. Care plans can outline the steps to stop these behaviors that can lead to a variety of poor health conditions.⁹

Vitals

A few minutes of daily head-to-toe visual checks helps you notice changes, like a new freckle or unusual hair growth or loss. Monthly checks of skin and your male or female parts give you information to share with your doctor. Especially relevant to patients managing chronic conditions, monitoring of relevant vitals (such as weight, blood pressure, daily steps, blood sugar, etc.) is an essential part of a care plan and self care.⁹

Managing Activities of Daily Living

Any other problems that affect the patient's general wellbeing can be relevant to the care plan. These can be things such as personal hygiene, functioning around the house, management of finances, transportation, safety behaviors, etc.⁹

How Care Plans Work

A care plan applies the different areas of concern (i.e. physical activity, nutrition, etc.) across the universal components (i.e. goals, instructions, etc.). There is a baseline care plan that exists for general healthy living, and this baseline becomes more customized to a person

as more information is collected. Factors such as sex, age, ethnicity, activities, conditions, etc. influence what content goes in a care plan, and how important those areas are to the person. Below is an example.



Isabella			
Health Concerns		Care Team	
Puberty		Mother Father	Pediatrician Coach
Goals		Instructions & Interventions	
Nutrition	Develop and maintain healthy eating habits and routines. Promote bone strength and growth. Reduce risk of iron deficiency from menstruation.	Eat breakfast every day to boosts the body's metabolism, improve energy and alertness, and reduce risk of obesity. Avoid junk and processed foods. Get 4 servings of calcium every day for bone growth and strength. Consume vitamin D enriched milk, eggs, and fatty fish like salmon to improve absorption of calcium. Get 8mg of iron a day, found in red meats, beans, and nutrient rich cereals.	Review eating habits next check-up. Assess for any barriers to nutrition plan adherence. Review iron levels to ensure that action is taken when a deficiency is observed.
Physical Activity	Maintain regular physical activity. Strengthen bones and muscles. Ensure adequate time for rest and relaxation.	Get at least 60 minutes of mostly aerobic exercise. Get muscle and bone strengthening exercise 3 days a week.	Review weight trend and adjust plan accordingly. Assess for barriers to exercise plan adherence.
Sleep	Get enough sleep. Get on a regular sleep schedule.	Prioritize 8-10 hours of sleep for active, growing bodies. Avoid sleeping in weekend to maintain a consistent routine. Stop using computer, phone, and TV 1 hour before bed for a better quality sleep.	Assess general morning energy levels at next check-up.
Mental Resilience	Grow confidence and maintain a positive body image.	Keep an open dialog with close family members or school counselors about physical/emotional changes. Received education on what changes to look for and what to do when they occur.	Review mental growth during this time to determine if a health professional or pediatrician is required for further assistance or counseling.
Managing	Ensure vaccinations	Schedule next HPV vaccination in 3	Assess upcoming vaccinations.

Figure 2: Sample Care Plan. See Appendix 1-3 for more samples, or visit www.goinvo.com/features/careplans

History of Care Plans

31st BC-15th Century

Much of medical history was focused in reactive care, rather than taking preventative measures for the individual's health. In the middle ages especially, the idea of preventative care could also have been stunted by the explanations of medical phenomena connected to spirituality and religious belief systems. Preceding modern medicine, most of the care regimens provided to patients were focused on either external symptoms, or a spiritual or magical basis.⁵⁴ The 16th to 19th century was a period of heavy scientific discovery, leading to the transition of supernatural explanations to natural explanations for disease and illness. People began to see illness as something that could eventually be eradicated, and saw health as a natural state of the body that should be maintained and protected, further stepping away from traditional notions of supernatural explanations or divine punishment.

20th Century

The 1930s marked the entry of clinically driven care plans into the nursing field. When stays in the hospital were longer, there was time to implement written plans. Nursing team leads would also use care plans as a guide for the less-educated members of the team. Virginia Henderson, "The Nightingale of Modern Nursing", was a clinically recognized nurse and instructor in the 1900s. She designed the basic nursing curriculum for the National League for Nursing that taught a patient-centered approach focused on nursing problems rather than medical diagnoses.⁶⁵

There were many fields involved in the emergence of life care planning during this time. This sub-specialty of psychology, called experimental analysis of behavior (EAB), provided research in charting behavioral changes over long periods of time. These behaviors could then be deconstructed into discrete actions that could be analyzed by the researcher. The technique of charting provided the case management professional with a tool in identifying individual components of care for a specific patient.⁶⁴

Developmental psychology provided a practical role in the development of life care planning. Through

conducting research on children with cerebral palsy, it was discovered that the overwhelming complexity of the needs of the patient required that a structured reference tool be provided as a road map of care. This provided the beginning of the framework for life care planning.⁶⁰

Case management is the collaborative process of assessing, planning, implementing, and evaluating the options and services for a person's health needs. In the early 1970s, the case management field began seeing the value of a detailed life care plan and became more involved with providing integrated services for those with long-term medical needs.⁶⁰

The converging principles of the fields of EAB, developmental psychology, and case management established life care planning factors: a summative statement, communication tool, preventative planning, basic components, individualized plans, and needs come first ideology. Life care plans started to develop in the 1970s after the convergence of research within several fields. Catastrophic disability research in the mid 1970s paved the way for the modern life care plan.^{62, 63}

Starting in the 1980s and in the following decades, life care planners were involved in consultations with insurance carriers and also with attorneys involved in litigation. Life care planning played a huge initial role in the field of litigation. It has since expanded into elder care, chronic illness and discharge planning. It has also expanded the number and types of professions who can each be involved in a part of care planning. Beginning in the 1980s, Life care plans began to gain greater acknowledgment through the help of the litigation field in cases involving debilitating injury. Damages in Tort Actions (1981) was the first published reference to life care planning through the analysis of personal injury cases.⁶¹

21st Century

The breadth of professionals and care providers within life care planning expanded, with individuals coming from rehabilitation counseling, rehabilitation nursing, psychiatry, and case management professions. Both paper based and

digital technology based care plans were regularly being used by patients and their care providers. As of January 2015, CMS transitioned Medicare to the more quality-based practice of reimbursing for care management of eligible patients with two or more chronic conditions. Other private insurance companies are beginning to follow suit to prioritize consistent, preventative care facilitated by patient-accessible care plans. This has encouraged the growth of digital care planning services that aid chronic

care management, such as CareSync, Wellframe, Bridge Patient Portal, and others. Many providers also utilize physical care planning materials like handouts and pamphlets for specific conditions. The pamphlet example below is a care plan for controlling high cholesterol. Inside are education about the diagnosis, room for high-level goal setting, slots to insert Care Cards for individual step goals, and the contractual agreement of the care team to better the patient's health.

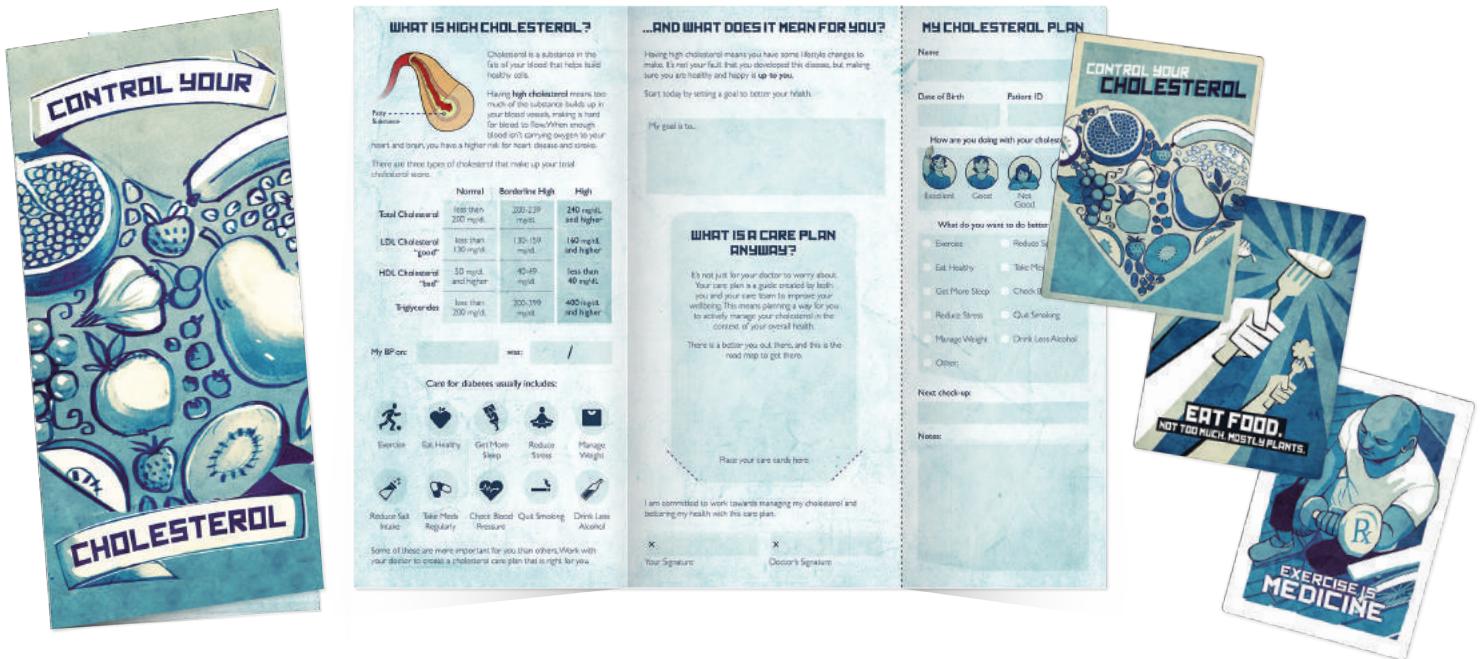


Figure 3: Care Plan Pamphlet, Involution Studios

The Current Landscape

The Process of a Care Plan

There is not yet any clinically recognized universal standard for care plan creation and implementation. But using elements derived from CMS's Meaningful Use Stage 2 requirements^{4,5}, the Coordinated Care Plan documentation from the Ontario Medical Association¹, the traditional nursing care plan structure³, and the Care Plan Glossary from the ONC's Standards and Interoperability Framework², we have created a generalized care plan journey map below.

The journey begins with a patient visiting his primary care doctor.



Understanding Health History

The beginning of any care plan process, whether creation or review, requires an understanding of the patient's health history. This should be summative in nature, and include basic information such as demographics, care team, vitals, problems, allergies, medications, therapies, notable encounters or procedures, and an indication of whether an advance care plan is in place. It is important to keep a patient summary up to date so that any care professional can reference it in an emergency.



Identifying Health Concerns

The next step is to identify current problems and health concerns. This can involve reviewing symptomatology, eating habits, physical activity, sleep habits, psychological issues, medication management, sexual health, cessation of bad habits, management of other daily activity, or any social or environmental health factors. Collection of vitals might also be involved in identification of health concerns.



Setting Goals

Goals are set to improve or resolve the identified health problems by the next review period. SMART goals (specific, measurable, achievable, realistic, time oriented) help break down goals into smaller specific steps. Goals should also be measured in a way that's quantifiable so that changes can be seen over a practice time frame. These can include both patient defined goals such as longevity, function, comfort, etc., and clinician defined goals.

Instruct and Intervene

After the desired outcomes are specified, the interventions and instructions on how to achieve those goals can be delivered. Instructions are educational directions to the patient/other providers about how to care for the patient's condition, what to do at home, when to call for help, additional appointments, testing, medication changes/instructions, among others. Interventions are specified actions taken as steps toward achieving care plan goals. This can include administration of physical treatment, creation or adjustment to the medication plan, prescribed activities or community/social services, or removal of barriers to success.



Enlist Care Team

A team of individuals should be enlisted in the care of the patient. The care team includes both professional parties who manage and/or provide care, including medical practitioners, nurses, allied health practitioners (physiotherapist, speech therapist, psychologist, pharmacist, etc.), social workers, and care managers; as well as non-professional members such as caregivers, family, friends, and the patient themselves. It should be determined by the patient which care team members are granted access to his or her health information.



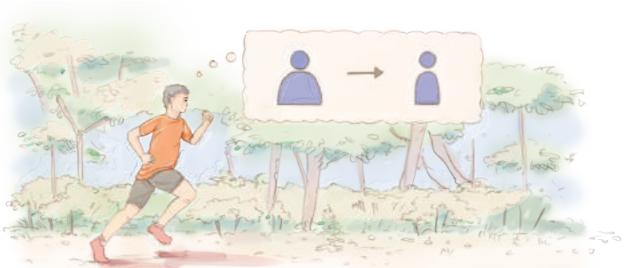
Specify Outcome to Review

It is important to set a specific time for review of the care plan to determine whether patient needs are being met and if adjustments need to be made. Low level, relatively healthy individuals may only need an annual review of the care plan, whereas those with more severe chronic illnesses may need a much more frequent checkup. Specific metrics for follow-up should be determined based on the health concerns and goals set.



Live the Care Plan

The most important part of the care plan process is how the patient implements it. They must translate guidance from their interactions with clinicians into sustained lifestyle behaviors to improve their own health. Self care makes up over 99% of healthcare, and it is only successful with a good care plan.



The process is a cycle. Patients live the care plan until the next medical encounter.

Care Plan Services

As of January 2015, CMS transitioned Medicare to the more quality-based practice of reimbursing for care management of eligible patients with 2 or more chronic conditions. Now, physicians, certified nurse specialists, nurse practitioners, and physician assistants are incentivized to perform 20 minutes of non-face-to-face care coordination services for every Medicare-qualifying patient each month.⁵ This can include tasks such as recording and coordinating patient health information (even from outside their own practice), managing care transitions (such as discharge from a hospitalization), coordinating clinical home or community services, systematic assessments of patient needs, and finally, the creation and review of a perpetually accessible comprehensive care plan. Now that Medicare has begun this transition, other private insurance companies are beginning to follow suit to prioritize consistent, preventative care facilitated by patient-accessible care plans. As a result, many care planning services have emerged to address the software needs of care management.

The matrix in Figure 3 aims to explore the effectiveness of current care plan services based on defined criteria. These services range from patient health records to commercially available health apps, but are all relevant to health information tracking and/or planning and goal setting. This is by no means an exhaustive list of existing care plans services, but rather a sampling of the various types of care plan-related services. Each service was scored based on the percentage of criteria met in each of the eleven topic areas.

A 0 means that none of the criteria points were fulfilled. To explore the criteria further, see Appendix 4. The final score, out of 100, is the average score of all criteria.

After reviewing the scores of these services, there is a clear distinction between patient portals (Bridge, Patient Fusion, Intelichart) focused on data interoperability, health history, and professional care team communication; and the less clinical services (CareZone, Healthtap, Wellframe, Healarium) focused on patient engagement, goal setting, and non-professional care team communication. Wellframe, CareSync, and HealthVault are the few that attempt to bridge the gap between those two focuses, putting them at the top of ranking as the more successful care plan services.

However, certain deficits seem to be shared by almost all of these services. While interoperability is a growing focus, there still seems to be trouble in adopting a universal data standard for content and holding services to consistent clinical quality metrics. Many services successfully incorporate data tracking and visualizations, but none present actual insight, projected outcomes, or recommendations from these data. Users are not being provided the option to export this information in its raw form for sharing and personal documentation. This means patients rarely 'own' their health own data.

These limitations, and others collected through secondary literature research are explored further in the next section.

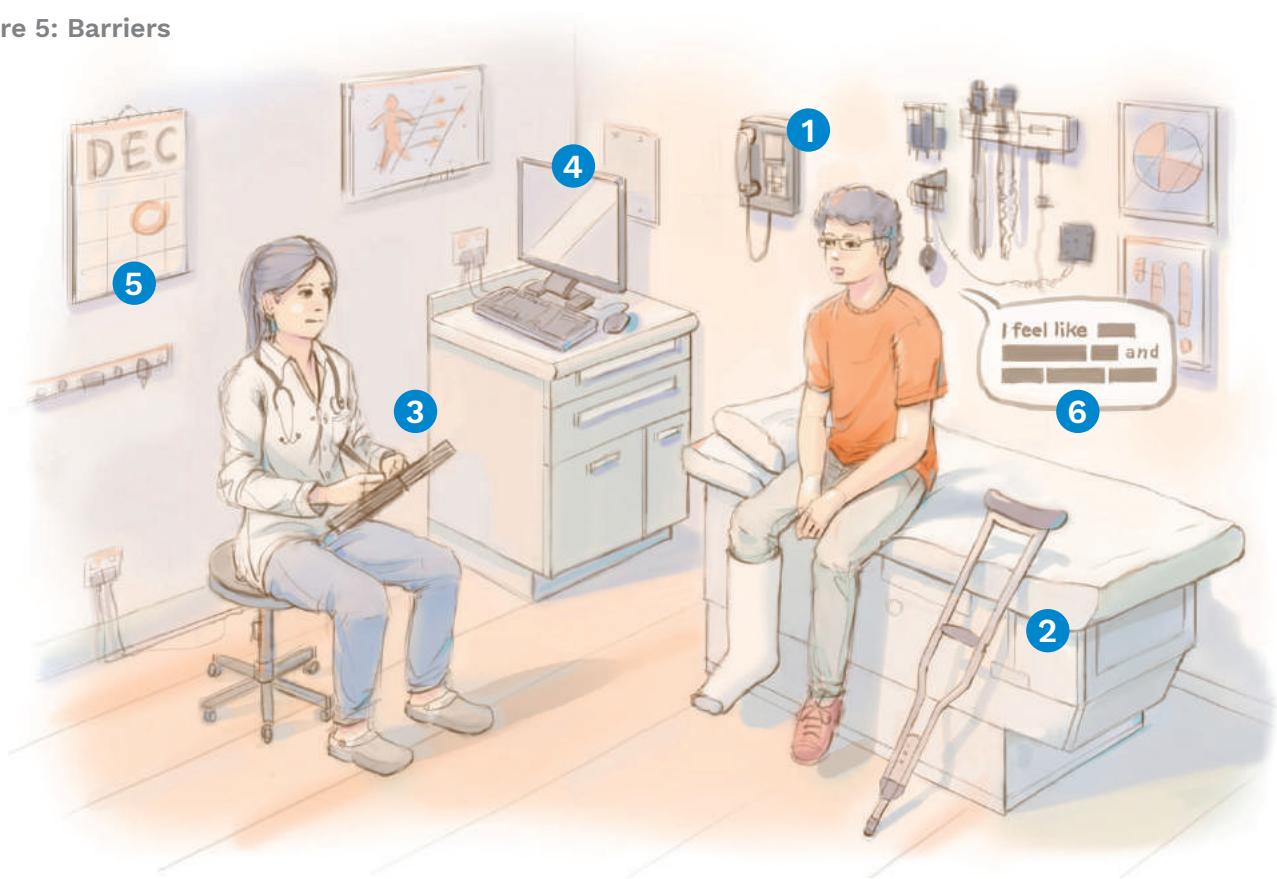
	Interoperability	Patient Summary	Education	Goal Setting	Vitals Tracking	Dynamic Intervention	Data Ownership	Prof. Team Comm.	Nonprof. Team Comm.	Validity	Breadth	Average
Wellframe ⁷²	50	50	80	60	25	50	75	40	0	100	50	53
healarium ⁷³	33	25	60	80	50	50	75	0	0	75	75	48
HealthTap ⁷⁴	20	25	60	80	0	0	75	80	20	50	100	47
amwell ⁷⁵	40	75	20	0	25	0	75	70	0	75	100	44
carezone ⁷⁶	20	50	0	40	0	0	50	15	65	0	30	25
Ocaresync ⁷⁷	80	100	20	40	50	0	100	30	80	25	100	57
caring _{in} place ⁷⁸	0	50	20	80	0	0	75	0	100	25	30	35
Bridge ⁷⁹ PATIENT PORTAL	100	75	40	20	0	0	75	60	0	50	70	44
In Touch ⁸⁰ MEDFUSION	40	100	25	20	0	0	75	30	0	0	70	33
Plus ⁸¹	80	75	40	0	25	0	50	40	0	0	70	35
InteliChart ⁸² patient portal	80	50	20	0	25	0	75	30	0	50	80	35
Microsoft HealthVault ⁸³	80	50	0	60	100	0	100	30	0	50	100	54
AskMD ⁸⁴	0	25	20	0	25	50	75	30	0	0	80	29
patient fusion ⁸⁵	80	75	40	20	25	0	100	30	0	50	70	43
Mychart ⁸⁶	60	50	0	0	50	0	75	30	0	0	70	30
happify ⁸⁷	0	0	60	60	25	0	50	0	0	25	10	21
HealthKit	33	25	0	0	75	0	50	0	0	0	100	26

Figure 4: Care Plan Service Landscape. See Appendix 4 for criteria descriptions.

Each service was scored based on the percentage of criteria met in each of the eleven topic areas. A 0 means that none of the criteria points were fulfilled. The final score, out of 100, is the average score of all criteria.

Barriers to Care Planning

Figure 5: Barriers



1. Communication issues

Patients and their medical providers suffer from poor information transfer, due to issues such as lack of time, lack of a standardized communication tool, the need to incorporate care planning and communication into the workflow, lack of compatible information technology across organizations, and privacy concerns of caregivers and patients. As healthcare IT systems are still in a relatively nascent stage and must adhere to a variety of patient confidentiality regulations, effective communication is still a crucial limitation.⁶⁶

2. Patient Noncompliance

Patient compliance is a difficult issue to address, and may be part of the reason that new roles such as grand-aides are beginning to appear in the healthcare landscape.⁶⁷ Some patients are not motivated to set goals. Others have issues complying with their medication and diet requirements. Those with mental illnesses are even more prone to discontinue medications without consulting a care provider.¹

3. Inaccurate Information

The Change Foundation in Ontario found that up to a $\frac{1}{3}$ of providers regularly relied on the caregiver and client to pass along information that was relevant to building the care plan.¹ This can be an issue when human error, both on the client and care provider side, may cause inaccurate recording of an individual's information. Patients at times may give inaccurate information regarding medications currently being taken. Care providers also oftentimes misjudge a patient's capacity to manage themselves within a home environment.⁶⁸

4. Creation in isolation

There is no current standardization of care plan content across health and social care organizations, as each functions under their own methods for care plan creation.⁶⁹ This creates a lack of consistency across the medical community, and increases the potential for medical error when organizations must interface on behalf of a patient. Not to mention patients receiving different medical advice and instruction for the same illnesses across

organizations will likely struggle with understanding and consequently, compliance.⁷⁰

5. Episodic Review

Implementation of care plans are not always straightforward, and information must be updated in a fluid manner in order for it to be an effective plan. However, difficulties can arise when there is a lack of ability within a patient's circle of care providers to access and update care plans. One factor can include difficulty in using the tool or application to update care plans.¹

6. Privacy concerns

Many situations can arise where it's difficult to know who to share the patient's information with without causing privacy issues. An issue that causes problems in communication is that the caregivers themselves are sometimes reluctant to share information with care providers due to privacy concerns.⁷¹

Next Steps for Care Plans

Care plans have come a long way since their conception. We have created a somewhat systematic approach to a patient health guide, yet have not standardized it for consistent communication and delivery of care. We have established appropriate intervention steps for a variety of diagnosed conditions, yet have not mastered the format and delivery of these steps so that they are effective and engaging to patients. We have learned how to collect massive amounts of crucial patient health data, yet we have not allowed the patient to carry that data with them and share throughout their diverse medical encounters. We are only on the cusp of health technology wave, and care plans have a bright future ahead of them.

The Future of Care Plans

Digitization

Distance and remote based care is growing with the continuing expansion of smartphone device consumption and installation of broadband services into homes and businesses. Expansion of free internet services, such as in the UK, where the National Health Service (NHS) will be converted into a free wi-fi zone, are also a driver of this digitization trend.⁸⁸ With better connectivity, internet speeds, and smart monitoring devices, there may soon

How can mobile phones and other technology make us healthier?

be a shift from the traditionally episodic, face-to-face care to a model where the immediate, remote, and individualized care plan is possible. Patients will be able to more consistently access, collaborate on, and adjust their care plans at home, work, school, while traveling, and in mobile clinics. This shift is especially important for less mobile and more vulnerable demographics such as new borns, physically disabled people, or seniors.

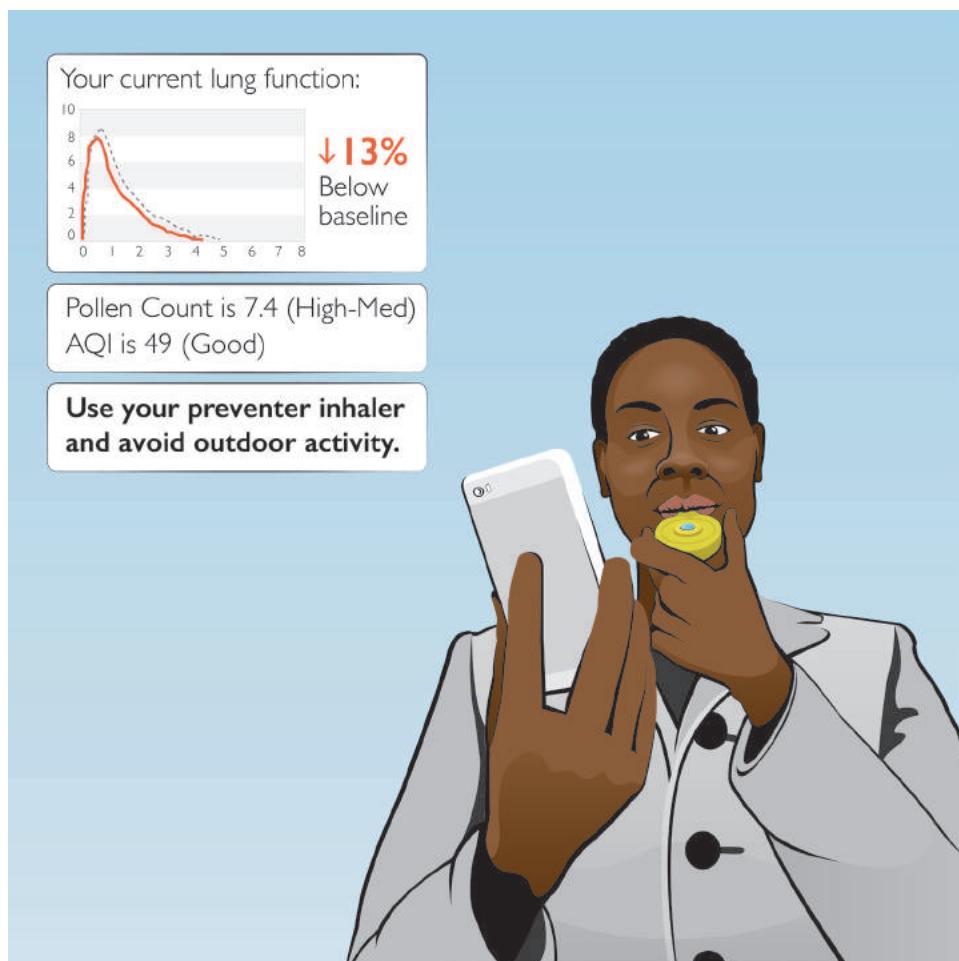


Figure 6: Smart spirometer and care plan app concept

Solving the complex problem of medication adherence could have a huge impact on lowering cost of care; It's no surprise that millions of dollars have already been invested in digital health software to guide the process. In 2016, expect the basics of digital adherence — self-reporting, tracking refills and chronic disease outcomes, etc. — will receive a boost from the use of sensors to collect confirming data, whether it's via breath analysis, urine sampling, or another non-invasive method.

For more examples of digital healthcare services of the future, visit <http://mobihealthnews.com/content/digital-healthcare-services-2016-and-beyond>

Standardization

There must be more consensus on care plan content. All this variation leads to miscommunication and errors in the transfer of care.

Standardization of care plans throughout the spectrum of health concerns will aid in communication and collaboration across care team members over time, providing high-quality longitudinal care with reduced risk for medical error. If medical community leaders converge to develop clinical pathways into a library of robust care

plan templates, they can then be customized to each patient's needs while still being interoperable among all care organizations. Using consistent quality metrics, the effectiveness of these templates can be assessed to identify how they must evolve and improve.

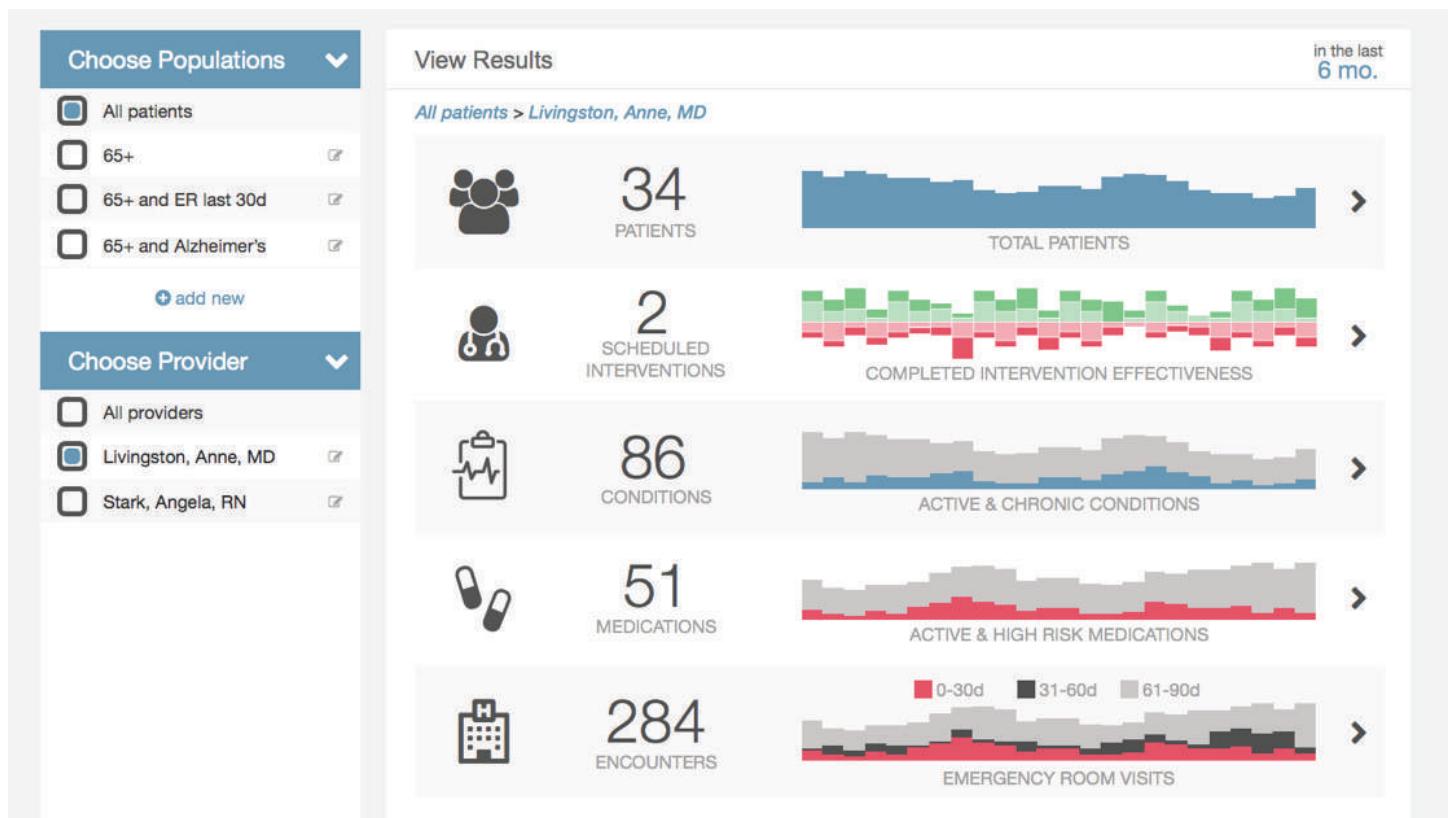


Figure 7: CMS-funded open-source [intervention engine](#)⁹³

Data Ownership

There needs to be an EMR system that can aggregate medical records, lab tests and scans, genomic data, and all other health data (including patient-generated) and analyze them in a meaningful way.

Patients will have an unlimited and ever-evolving reservoir of data collected from embedded devices, mobile phones, and other sensors that is then synthesized into an understandable personal health score. Predictive analytics will help identify patterns in this data to create actionable insights and recommendations for care plan adjustments. With the advent of human genome mapping, we can further fine tune care plans according to patient's family medical history and genetic predispositions. In a

broader context, we can look at the population's genetic data comparatively to differentially diagnose various health conditions. Once we can move past the stigma of sharing health record information with patients and the complexity of securing the information from harm, we can approach the ideal world where patients are the rightful owner of their health data, using it to maintain a holistic view of their health.

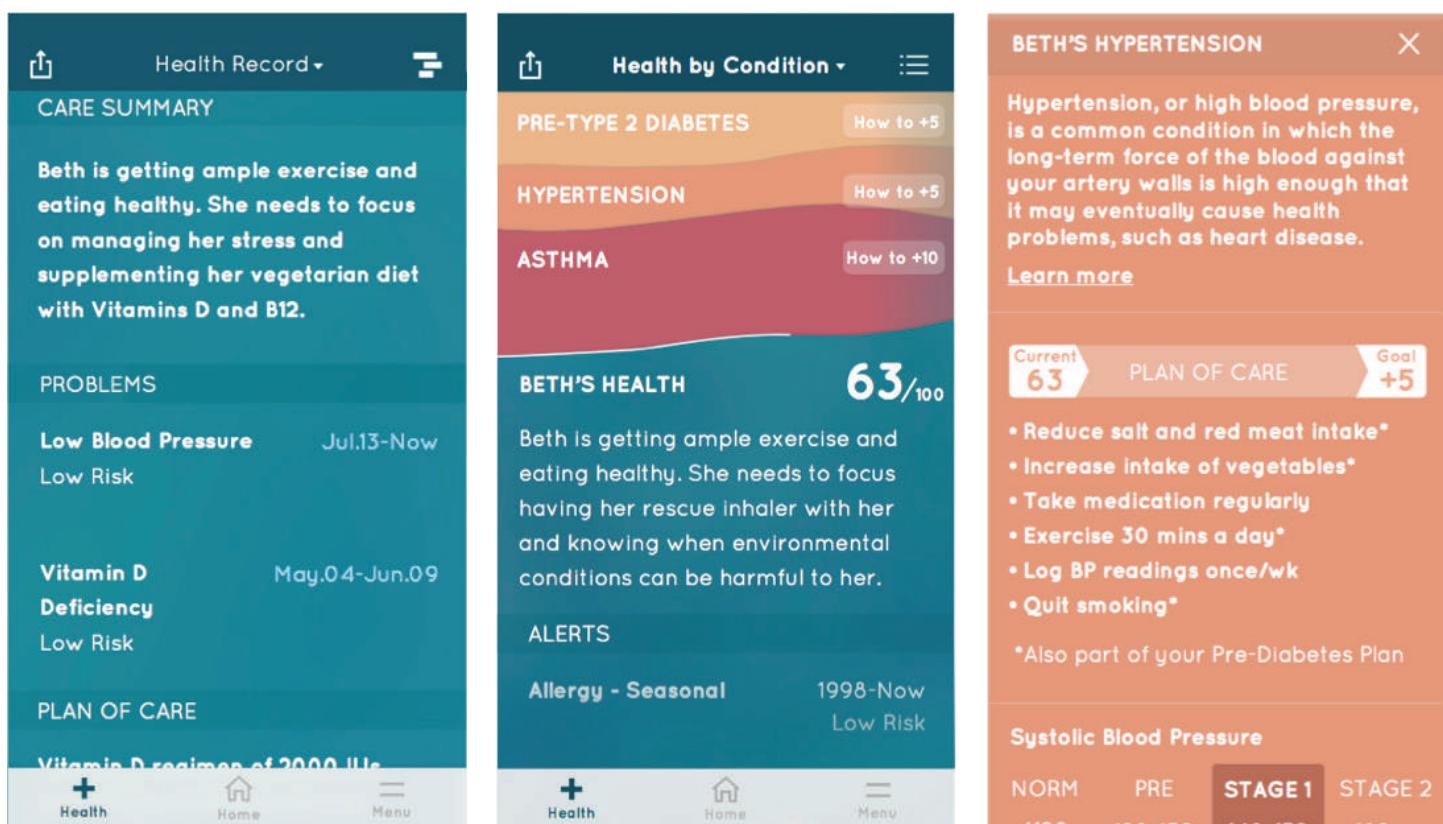


Figure 8: Personal Health Record concept for viewing health information by C-CDA format, by condition, and a detail view of care plan

Patient Empowerment

We need care plans to be more than list of instructions. They need to serve as a continuous source of diagnosis, relevant education, informative insights, and encouragement to take action.

Patients should never leave a doctor's office empty handed. Building an accessible digital care plan together with their provider will allow for both a more active discussion and a more empowered patient. When the patient feels a part of the decision making process and concludes a medical encounter feeling valued, knowledgeable, and supported

by an accessible digital care plan, their likelihood of compliance to healthier 'self care' behaviors will grow. Similar engagement of caregivers will grow compliance even further as these more consistently present care team members are informed and empowered to help implement the care plan.

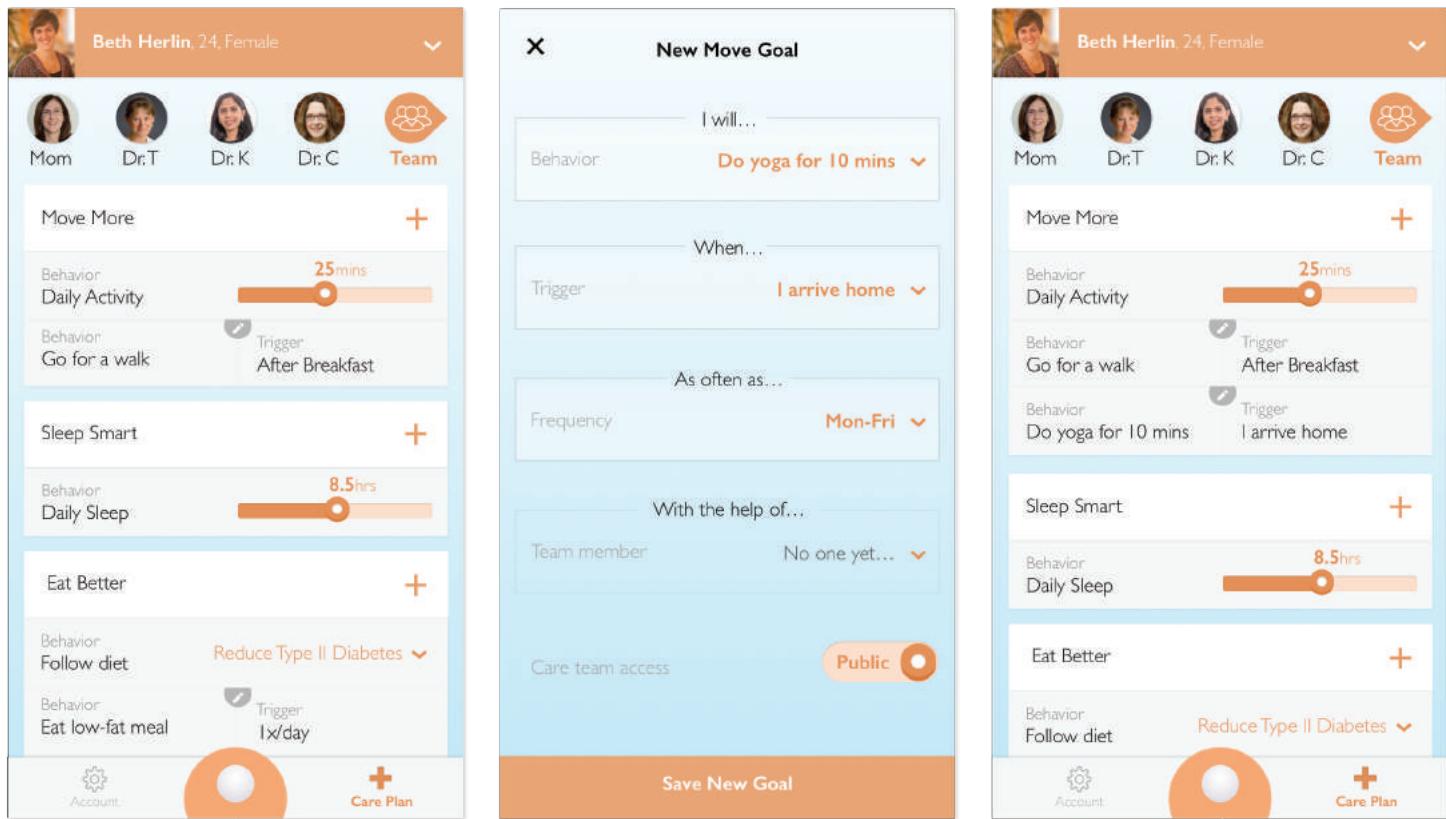


Figure 9: Care plan app concept. User carries their co-created step goals with them in their smart phone, receive reminders and encouragement to achieve, and recommendations for adjustment based on collected data. ([see Appendix 5 for more figures](#))

Expanding the Care Team

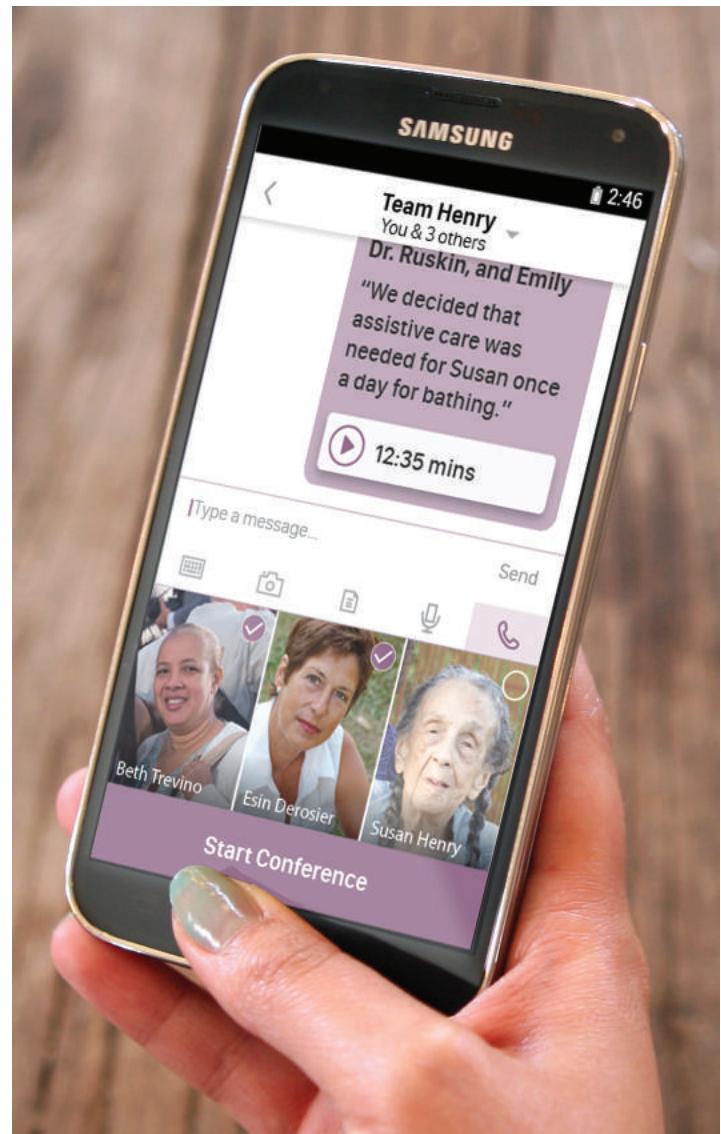
A more holistic approach to care planning suggests a greater need for cohesive inclusion of the patient's direct network into their care team.

In order to achieve better engagement and adherence to care plans, non-professional caregivers (friends and family) will be incorporated into the care team. These team members have the highest degree of access to the patient, and the most incentive to provide care. Services that expand education and engagement to both the patient AND these members will emerge to fully utilize this component of the care team.

Another important presence in this expanding care team is the online community. We will start to see services that incorporate community forums and population analytics to take advantage of the the wealth of knowledge and experience of similar patients.

The advancement of digital care plans has surfaced the need for new healthcare roles that bridge the gap between providers and patient-facing technology. One emerging role, the nurse extender clinical aide, or grand-aide, interacts more frequently with patients to ensure adherence to the care plan and keeps the more highly-trained providers informed about the status of the patient.⁸⁹

Figure 11: Care team communication concept. User can start a conference call directly from the team message stream, record the call, attach a notes, and send the summary to the team.



Dynamic Intervention

Patients need more diagnosis, goal setting, and guidance than an annual check up with their doctor in order to engage in effective, preventative self care.

As digital care plans gain the ability to deliver personalized health content (including goals) and collect relevant metrics, the opportunity arises to coalesce these functions into a feedback loop. This means the care plan will facilitate a prescribed or selected care plan with specified goals, assess relevant data from vitals sensors, the environment, or behaviors, to determine if the goal criteria is met, and then auto-adjust the care plan goals and education accordingly. Health scores

and predictive analytics will be used to aid engagement and understanding of the care plan and any changes to it. The use of patient health projections and relevant recommendations creates a kind of intervention engine that could behave autonomously from medical providers, though it could always be augmented and further personalized when clinician input is available. However, the concept of an intervention engine is dependant on a clinically-validated database of interoperable care plans.

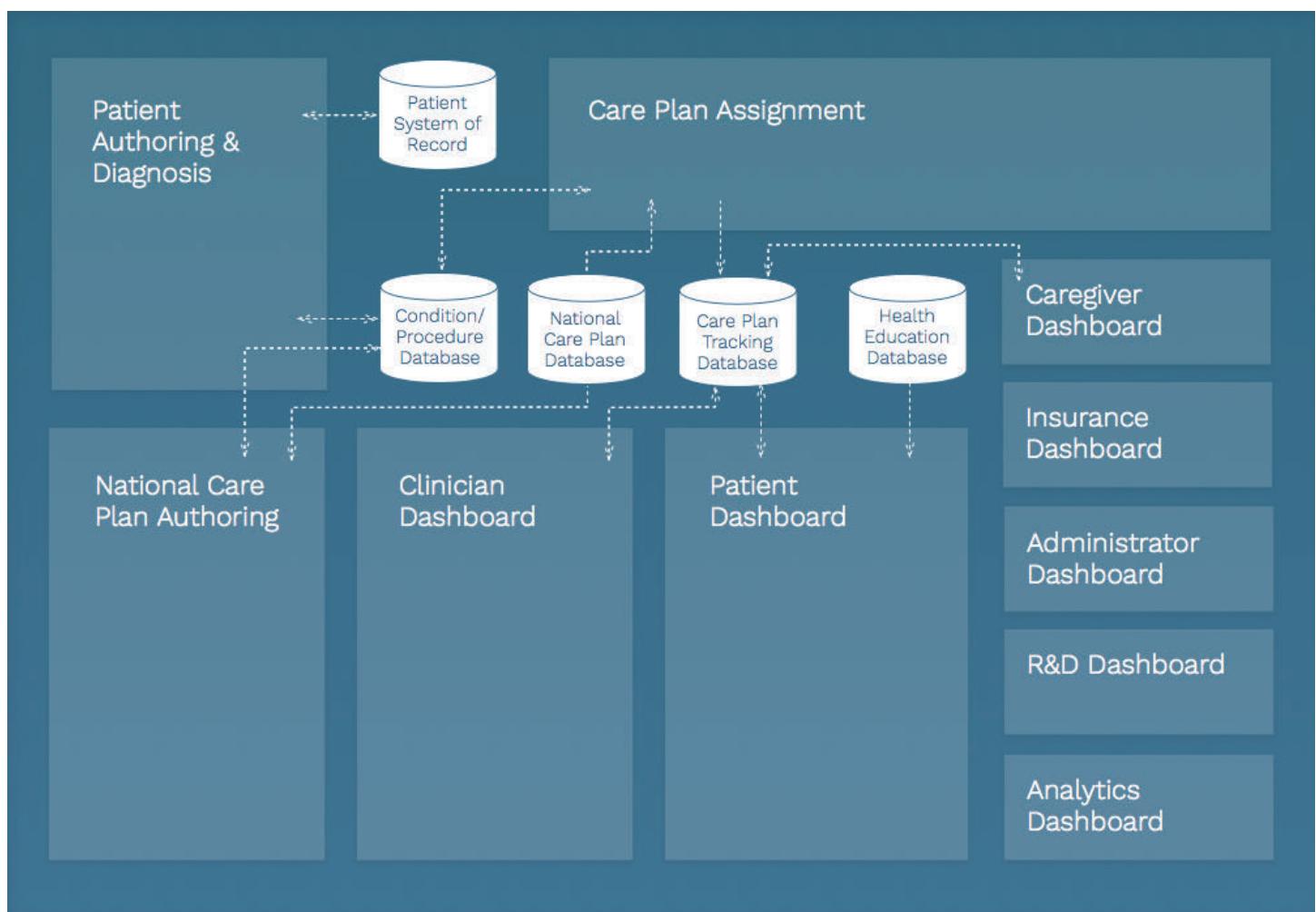


Figure 10: Intervention Framework. See Appendix 6 or visit www.goinvo.com/features/careplans to download the full poster.

Healthcare is Shifting

In the face of high costs and doctor shortages, healthcare must transition to promoting efficiency of clinical and non-clinical staff, and scaling of accessible digital services.

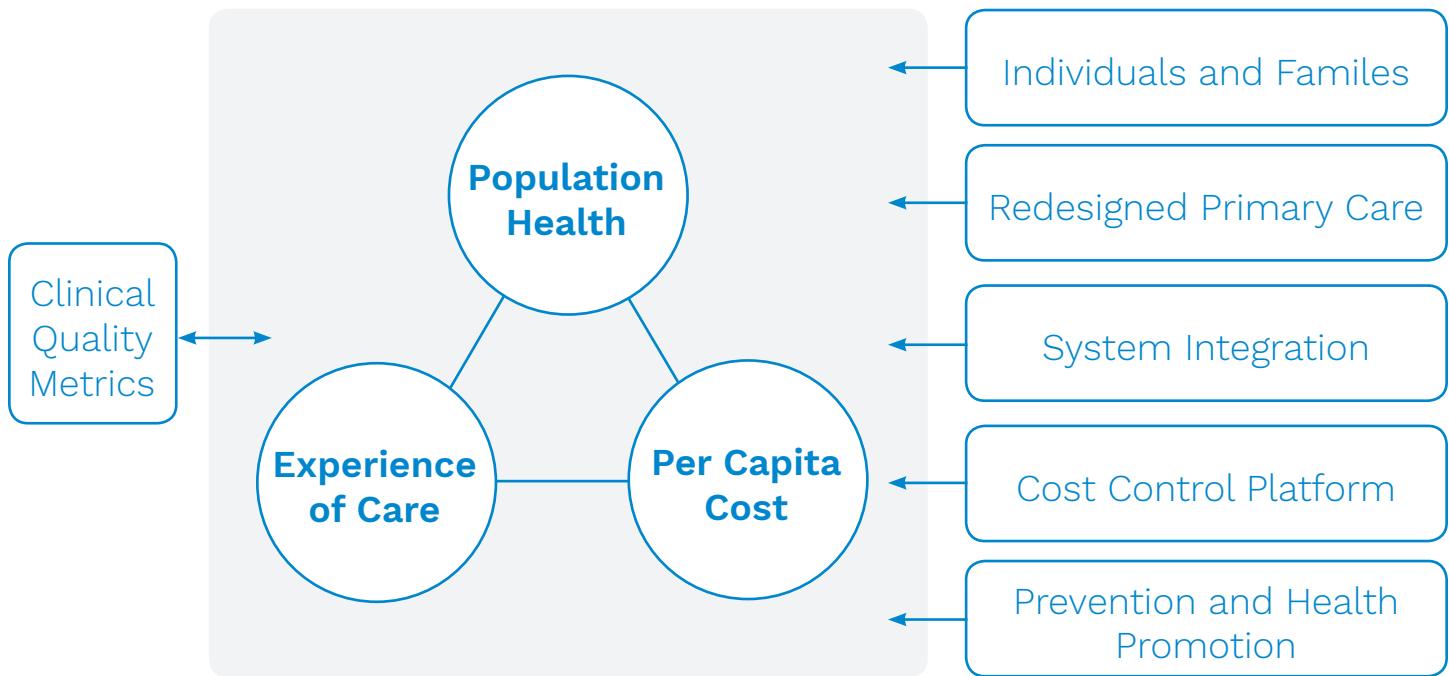


Figure 12: Institute for Healthcare Improvement (IHI) “Triple Aim” Concept System⁹⁰

The expansion of health coverage and the growing influx of patients will force a significant shift in the way healthcare is provided. More patients means a need for more providers. This will expand the roles and responsibilities of nurses, physician's assistants, and other lesser-trained professionals, to provide more continuous care to more patients at one time. It also illuminates the benefit of utilizing the non-professional side of the care team, such as family caregivers and the online community in the care plan.

Healthcare payers are transitioning from a volume-based to value-based payment model, meaning that medical professionals will only get paid for the success of care,

rather than for conducting the care itself. This shift requires quality metrics to assess outcomes, which can only be achieved through consistently delivered care plans and comprehensive health data tracking. When the feedback loop of an intervention engine is achieved, effectiveness of standardized interventions can be understood to accurately provide reimbursement and improve national healthcare as a whole.

Digital, standardized, dynamic, care plans will both augment effectiveness of our limited supply of medical professionals, and empower patients to engage in cost-effective, preventive self care behaviors.

Conclusions

Roadmap to the Future

Push for a Culture Shift

Over 70% of clinicians still refuse to share their clinical office notes with their patients.⁹¹ Yet, studies show that offering these notes to patients increases patients' sense of control, increases medication adherence, and does not significantly increase clinician time spent answering questions or taking notes.⁹² The more culture in the medical community shifts to that of transparency in all medical encounters, the more likely that patients will become more involved in their care and behave in healthier ways. Patients deserve not only to own their own health data, but to take part in the care planning process. Because they are responsible for conveying the information used for diagnosis, and for implementing whatever plan is created, patients are the most important member of their own care team. It is time to allow patients, and their vital nonprofessional care team members, be a part of the clinical decision making process. With the increasing shortage of medical providers, it is beneficial for clinicians to extend responsibility and accountability the non-clinical care team members such as health coaches, family caregivers, and other networks.

Better Stories, Better Prices

For digital care plans to progress, technological advancement is needed in three key areas.

We need to evolve health sensors to track complex chronic conditions with minimal workload from the patient. Whether it is happening on the smart phone or in another enchanted object, ambient sensing of contextually relevant metrics to the patient would enrich the care plan with insightful information and trends. However, technology

advances in producing these sensors more affordably is needed to extend access to a wider demographic of people. Cheap sensors and diagnostic tools will be especially beneficial to populations in remote areas with little geographic access to clinicians.

Another key technological need is the growth of experience-focused health software solutions that engage people to change behavior. Synthesis of knowledge in behavioral fields of study with usability and experience design principles is needed to create effective strategies for promoting understanding of health information and goal setting and execution in health applications.

The third key technological need is that of sophisticated data analytics. As sensors and remote diagnostic tools become more widespread, we need to be able to synthesize the wealth of data into a meaningful story for the patient, the clinician, and the rest of the care team. Payers already utilize various risk scoring frameworks for insurance purposes. These strategies can be extended to create a patient-facing health score, which would improve shared understanding and engagement, facilitate communication among care team members, and aid clinicians and care managers in prioritization of patients.

Establish National Standards

Clinical decision support systems are growing to provide condition-specific order sets, clinical guidelines, focused data reports, and diagnostic support to clinicians at the point of care. With these systems in place, the wealth of new medical information can be synthesized, validated, and rapidly transition from research to practice. This systematization of information collection and application

needs to be expanded to patient-facing care plans. Once a national library of condition-specific care plans is achieved, they can be consistently implemented both in a patient-clinician medical encounter, and independently by the patient and other care team members. Using quality metrics to assess the care plan outcomes, we can then in near-real time, update the standards to improve care.

Create an Intervention Engine

In conjunction with the development of these technological advancements and national standards, we can start to create an autonomous engine that collects data relevant to chronic conditions, synthesizes it into meaningful information, interfaces with the national care plan library to select appropriate adjustments and recommendations, and delivers these recommendations along with any manual clinician input in an engaging way to patient and their care team. This engine is not meant to replace interaction with clinicians, but rather, augment it by providing continuous care in between medical encounters. Crucial to such an engine is the ability to compare assessed outcomes with interventions made to understand effectiveness across the entire population of patients. This will allow the engine to 'learn' and evolve, providing better and better care.

Call to Action



Patients, Otherwise Known as “People”

Take part in building your care plan with your doctor. You’re the most knowledgeable part of your care team.

Ask questions. Be informed.

Take responsibility for your own health. Live your care plan.



Healthcare Designers & Entrepreneurs

Adopt FHIR. It’s the lesser of all evils for now. Data MUST be interoperable.

Know the clinical workflow. Your product should be a no-brainer for doctors, patients, and proxies.

Give patients and their team authorship in the care plan process.



Medical Community

Patient engagement is worth the investment. Activated patients behave in healthier ways.

Transparent communication and complete accessibility to data make for more informed, healthier patients.

Consider building a broader care team for the patient that leverages the expertise of health coaches, family, and community networks, and facilitates communication between clinic visits.

Collect evidence and adjust care to get better outcomes. Value-based care is taking over Medicare payments (50% by 2018).



Policymakers

Single payer - We can’t better health until there is equal accessibility to care.

Single standard - Meaningful Use 4 (or the next ONC health guidance as MU might be replaced) needs to dictate a national health data standard.

National Care Plan Database - Clinical standards should drive and populate individual care plans, which in turn should drive national database evolution. A .gov organization needs to deliver, maintain, and curate care plans from and for US-based hospital systems.

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Appendix

Appendix 1: Care Plan Example, 13 year old female with no known health conditions

 <p>Isabella</p> <p>Isabella is a 13-year old, active 7th grader who plays the flute and is a defender on the girls soccer team. Isabella snacks throughout the day and does not like meat very much.</p>			
Health Concerns		Care Team	
None		Mother	Pediatrician
		Father	Coach
Goals		Instructions & Interventions	Review
Nutrition	<ul style="list-style-type: none"> Develop and maintain healthy eating habits and routines. Promote bone strength and growth. 	<p>Eat breakfast every day to boosts the body's metabolism, improve energy and alertness, and reduce risk of obesity.</p> <p>Avoid junk and processed foods.</p> <p>Get 4 servings of calcium every day for bone growth and strength.</p> <p>Consume vitamin D enriched milk, eggs, and fatty fish like salmon to improve absorption of calcium.</p>	<p>Review eating habits next check-up.</p> <p>Assess for any barriers to nutrition plan adherence.</p>
Physical Activity	<ul style="list-style-type: none"> Maintain regular physical activity. Strengthen bones and muscles. Ensure adequate time for rest and relaxation. 	<p>Get at least 60 minutes of mostly aerobic exercise.</p> <p>Get muscle and bone strengthening exercise 3 days a week.</p>	<p>Review weight trend and adjust plan accordingly.</p> <p>Assess for barriers to exercise plan adherence.</p>
Sleep	<ul style="list-style-type: none"> Get enough sleep. Get on a regular sleep schedule. 	<p>Prioritize 8-10 hours of sleep for active, growing bodies.</p> <p>Avoid sleeping in weekend to maintain a consistent routine.</p> <p>Stop using computer, phone, and TV 1 hour before bed for a better quality sleep.</p>	<p>Assess general morning energy levels at next check-up.</p>
Mental Resilience			
Managing Medication	Ensure vaccinations are received.	<p>Schedule next HPV vaccination in 3 months.</p> <p>Get influenza vaccine in the fall.</p>	<p>Assess upcoming vaccinations.</p>
Sexual Health			
Cessation of Bad Habits	<ul style="list-style-type: none"> Get less screen time. Reduce bad snacking behaviors. 	<p>Spend less than 2 hours of continuous time on screens - try timers, parental controls.</p> <p>Keep only healthy snacks (fruits, vegetables, nuts, whole grains) in the house.</p>	<p>Assess for barriers to achieving goal screen time.</p> <p>Review satisfaction/adherence to snacking goals.</p>
Tracking Vitals	Track height and weight.	Track height and weight once a month with phone application or pencil and paper.	<p>Schedule yearly physical exams with pediatrician.</p> <p>Test regularly for anemia.</p>
Managing ADLs	Remembering to brush teeth daily.	Leave a reminder on the bathroom sink, or set an alarm.	

Appendix 2: Care Plan Example, 35 year old male with depression



Reggie

Reggie is a 35 year old, successful, driven accountant who works 8am-6pm in downtown Boston and commutes home to a nearby suburb. On the weekends, Reggie likes to swim at the local fitness center or go on walks with his labradoodle. Reggie is in long distance relationship, and sees his boyfriend about once every 2 weeks.

Health Concerns		Care Team
Depression		Primary Care Physician, Boyfriend, Mother, Friends, Psychiatrist, Psychologist, Pharmacist
Goals	Instructions & Interventions	Review
Nutrition Eat a healthier, plant-based diet. Reduce depression-related over-eating.	Eat more vegetables, fruit, nuts, beans, and whole grains, less meat. Avoid red meats, processed meats, or cured meats. Eat 2-3 servings of fish a week (for the fish oils). Replace the fatty snacks consumed when gaming, with a fresh fruit. Avoid the free high-fat snack foods at the accounting firm. Meatless Mondays. Avoid or manage stressors through relaxation techniques such as meditation. Discuss eating habits during therapy sessions.	Review eating habits next check-up. Assess for any barriers to nutrition plan adherence. Review any dietary problems such as emotional eating.
Physical Activity Sit less and maintain current body weight by staying active. Improve mood through endorphins.	Get 30 minutes of physical activity a day. Join a local swim team that meets twice a week. Use a bike for the 30 minute work commute. Find alternate bike paths to stay motivated and interested in the exercise. Get regular aerobic exercise.	Review weight trend and adjust plan accordingly. Assess for barriers to exercise plan adherence.
Sleep Feel more awake in the mornings for work. Reduce depression-related fatigue and decreased energy.	Turn the games/computer off at least an hour before bed. Go to bed by midnight to sleep at least 8 hours for the 8am job. Staying active promotes better sleep. Participate in fun activities with friends and loved ones. Avoid caffeine 6 hours before bedtime.	Review general morning energy levels a month from now. Review any depression-related sleep disturbances.
Mental Resilience Reduce the stress from partner often being absent. Improve mood. Reduce irritability and restlessness. Reduce difficulty concentrating.	Call partner by next month, and communicate the reason for the stress. If interest in hobbies are still lacking two weeks from now, seek appointment with specialized mental health professional. Focus on meeting with friends more often. Attend therapy sessions as directed/needed.	Review mental stress condition with a care provider. Review mood improvement, irritability, restlessness, and difficulty concentrating.
Managing Medication Get vitamin D levels up to the normal range to lower the risk of depression.	Take 2000IU's of vitamin D3 every day. Place daily vitamins by the coffee maker to incorporate them into daily routine.	Review vitamin D levels every 3 months. Review change in symptoms.

Appendix 3: Care Plan Example, 68 year old female with hypertension

<p>Donna</p>  <p>Donna is a 68 year old, retired bank clerk living in downtown Chicago with her husband. She enjoys doing crossword puzzles and watching TV at night, and therefore doesn't leave the apartment much. Donna was recently diagnosed with hypertension at her last annual check-up.</p>			
Health Concerns <p>Hypertension</p>		Care Team <p>Primary Care Physician, Daughter, Husband, Neighbor, Cardiologist, Pharmacist</p>	
Goals		Instructions & Interventions	Review
Nutrition	Eat a healthier, plant-based diet. <i>Eat a heart-healthier diet to help reduce blood pressure.</i>	Eat more vegetables, fruit, nuts, beans, and whole grains, less meat. Avoid red meats, processed meats, or cured meats. Avoid processed meals by signing up for Meals on Wheels delivery once a week to help deliver healthier groceries to cook with. <i>Do not consume more than 2,300 milligrams of sodium a day.</i> Avoid spreading butter or adding cream to any grains. Eat 6 to 8 servings of grain a day, such as cereal and rice. Eat 4 to 5 servings of vegetables a day, especially leafy green vegetables.	Review eating habits next month. Review any barriers to nutrition plan adherence. <i>Review food being consumed, and make changes in nutrition plan with blood pressure levels in mind.</i>
Physical Activity	Get more active. <i>Maintain regular exercise regimen to help reduce blood pressure and stress.</i>	Begin with a local community center that offers exercise classes for seniors and has sessions at least 3 times a week. <i>Prioritize aerobic activity (such as brisk walk) for your 30 mins of activity each day.</i>	Review mobility and movement changes 4 months from now. Review for barriers to exercise plan adherence.
Sleep	Reduce the time it takes to get to sleep.	Buy soft earplugs for daily use to reduce noise coming from the windows. Turn off all TV lighting at least an hour before sleeping.	Review quality of sleep next month and consider a sleep aid.
Mental Resilience	Increase social interaction and community involvement. <i>Reduce stress.</i>	Join a local community organization to social engage with people around a hobby. <i>Practice deep breathing, positive self-talk, or meditation to cope with and prevent stress.</i>	Review satisfaction with community involvement or barriers to social interaction. <i>Consult with a care provider to discuss current levels of stress and if a specialist is needed.</i>
Managing Medication	Improve vitamin B6, B12, and Folate deficiencies by taking supplements regularly. <i>Reduce blood pressure by complying with the medication.</i>	Improve vitamin B6, B12, and Folate deficiencies by taking supplements regularly. <i>Begin with thiazide diuretics such as hydrochlorothiazide.</i>	Test vitamin levels every 6 months and adjust dosage accordingly. Review medication regimen with a care provider to determine if doses may need to be adjusted.

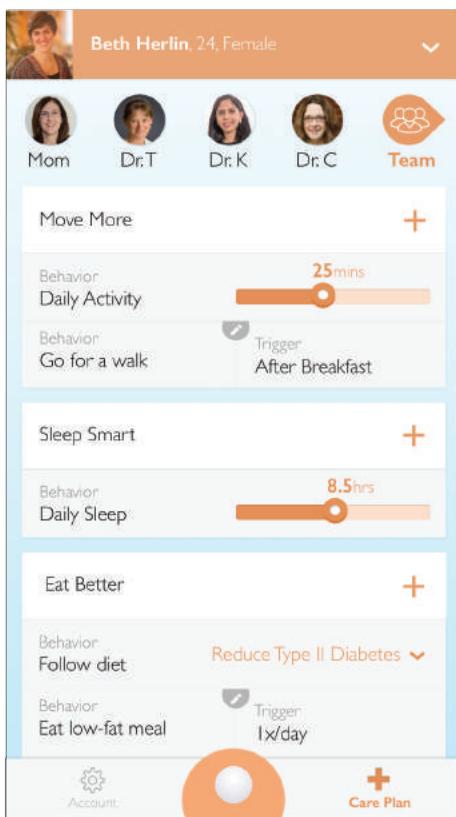
Appendix 4: Care Plan Service Criteria

Standardization and Interoperability	<p>Complies with meaningful use requirements (providing patients with encounter notes/discharge summaries).</p> <p>Meets CDA and/or FHIR data standards to integrate with EHRs.</p> <p>CQM standard compliance</p> <p>HIPAA compliant.</p> <p>Integrates with clinical workflows.</p>
Patient Summary and Health History	<p>Provides overview of general health condition.</p> <p>Service takes into account patients individual health concerns.</p> <p>Provides comprehensive medical history.</p> <p>Ease of obtaining medical record or medical history information.</p>
Patient Instructions and Education	<p>Personalized, time-based instructions from care providers for both short and long term.</p> <p>Dynamic instructions based on assessment of understanding and new data.</p> <p>Education reinforcement through reminders, and context-sensitive notifications.</p> <p>Links to external relevant resources.</p> <p>Accounts for individual demographics (language, culture, age etc.)</p>
Patient Empowerment and Goal Setting	<p>Education-facilitated goal setting with or without clinician input.</p> <p>Editable and shareable plan of time-based goals.</p> <p>Patient encouragement and incentive.</p> <p>Feedback on progress toward goals.</p> <p>Projected outcomes based on current adherence trends.</p>
Connectedness / Vitals Tracking	<p>Tracks progress towards specified care plan goals either manually through user input or through ambient sensors.</p> <p>Collects and stores biometric data such as heart rate, blood pressure, respiration patterns, posture, weight, physical activity, etc.</p> <p>Connects with other health applications and services (HealthKit, Fitbit, Jawbone, Withings, etc.) that track vitals.</p> <p>Ability to view trends in data.</p>
Data Insight and Dynamic Intervention	<p>Provides summative insights about health status and actionable recommendations/education for improvement.</p> <p>Provides projected outcome of recommended intervention.</p> <p>Communicates summative trends in progress and health concerns to providers.</p> <p>Incorporates provider input into dynamic care plan.</p>

Continued on next page

Patient Data Ownership and Access	<p>Provides secure access and proxy rights to view and edit health information</p> <p>Provides ability to export health information for personal records.</p> <p>Accessibility from many devices.</p> <p>Real time updating to the most recent health information.</p>
Professional Care team communication	<p>Collects and stores contact information for all professional providers of care.</p> <p>Provides a search engine to locate and contact new care provider.</p> <p>Can schedule a physical or virtual appointment with a care provider.</p> <p>Can call or send an asynchronous message to care provider.</p> <p>Can synchronously chat or virtually consult with a care provider.</p> <p>Communication can be recorded and stored for later review.</p> <p>Can provide access to all or specific health information to select care providers.</p>
Non-Professional Care team communication	<p>Collects and stores contact information for all non-professional caregivers, friends, and family members involved in care.</p> <p>Can call or send an asynchronous message to caregiver.</p> <p>Can synchronously chat or virtually consult with a caregiver.</p> <p>Communication can be recorded and stored for later review.</p> <p>Can collaborate on health tasks with caregivers.</p> <p>Can provide access to all or specific health information to select caregivers.</p>
Clinical Validity	<p>Clinical trials or studies conducted to objectively view health efficacy.</p> <p>Involves vetted care professionals.</p> <p>Integration with clinical workflows.</p> <p>Reputable health or medical organizations or professionals behind product development.</p>
Content Breadth	Covers the areas of: nutrition, physical activity, sleep, mental resilience, medication management, bad habit cessation, sexual health, and managing activities of daily living.

Appendix 5: Care plan app concept. User carries their co-created step goals with them in their smart phone, receive reminders and encouragement to achieve, and recommendations for adjustment based on collected data.



New Move Goal

I will... **Do yoga for 10 mins**

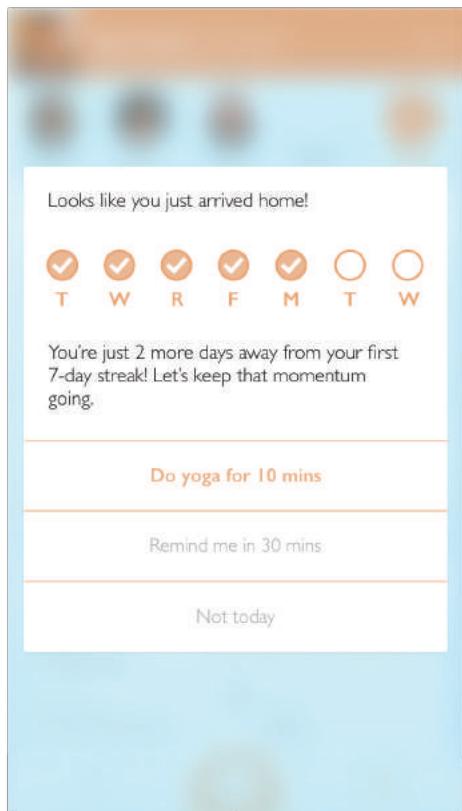
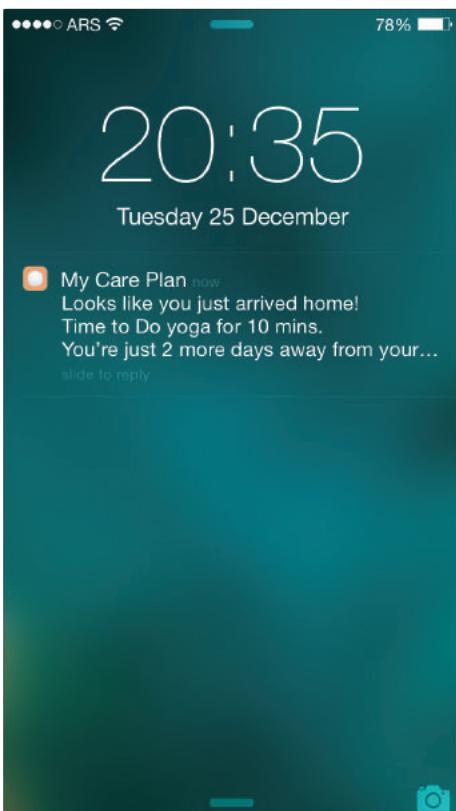
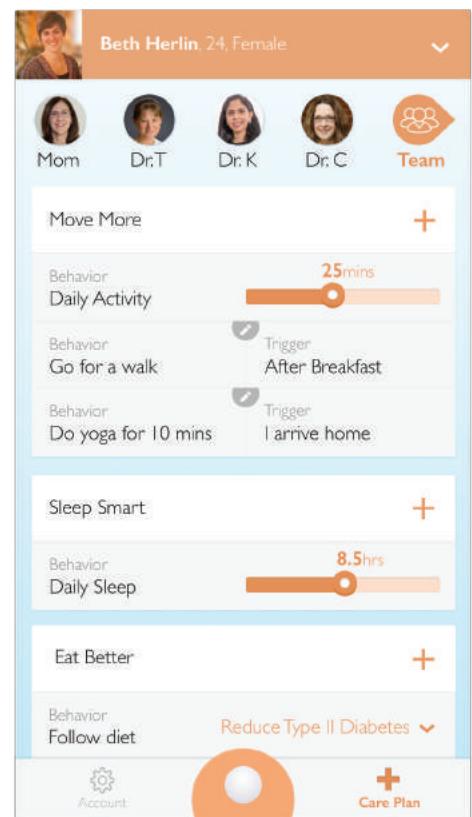
When... **I arrive home**

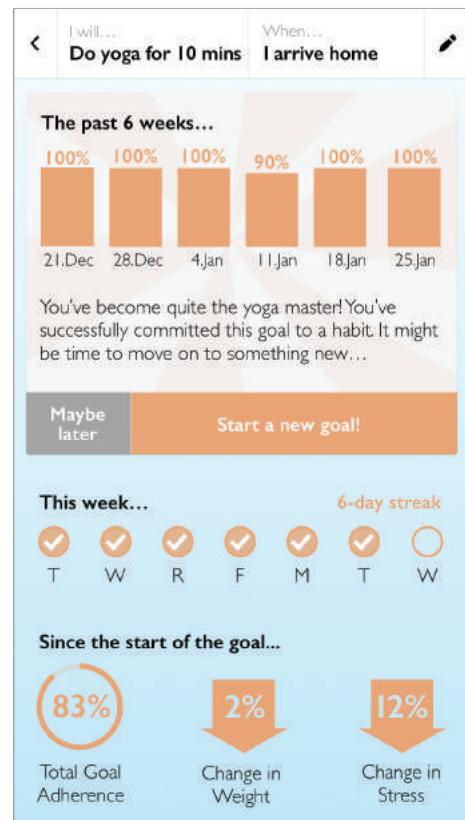
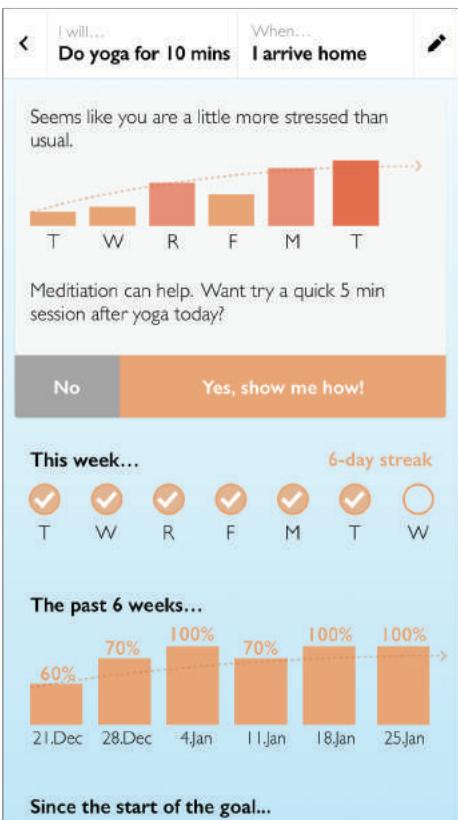
As often as... **Mon-Fri**

With the help of... **No one yet...**

Care team access **Public**

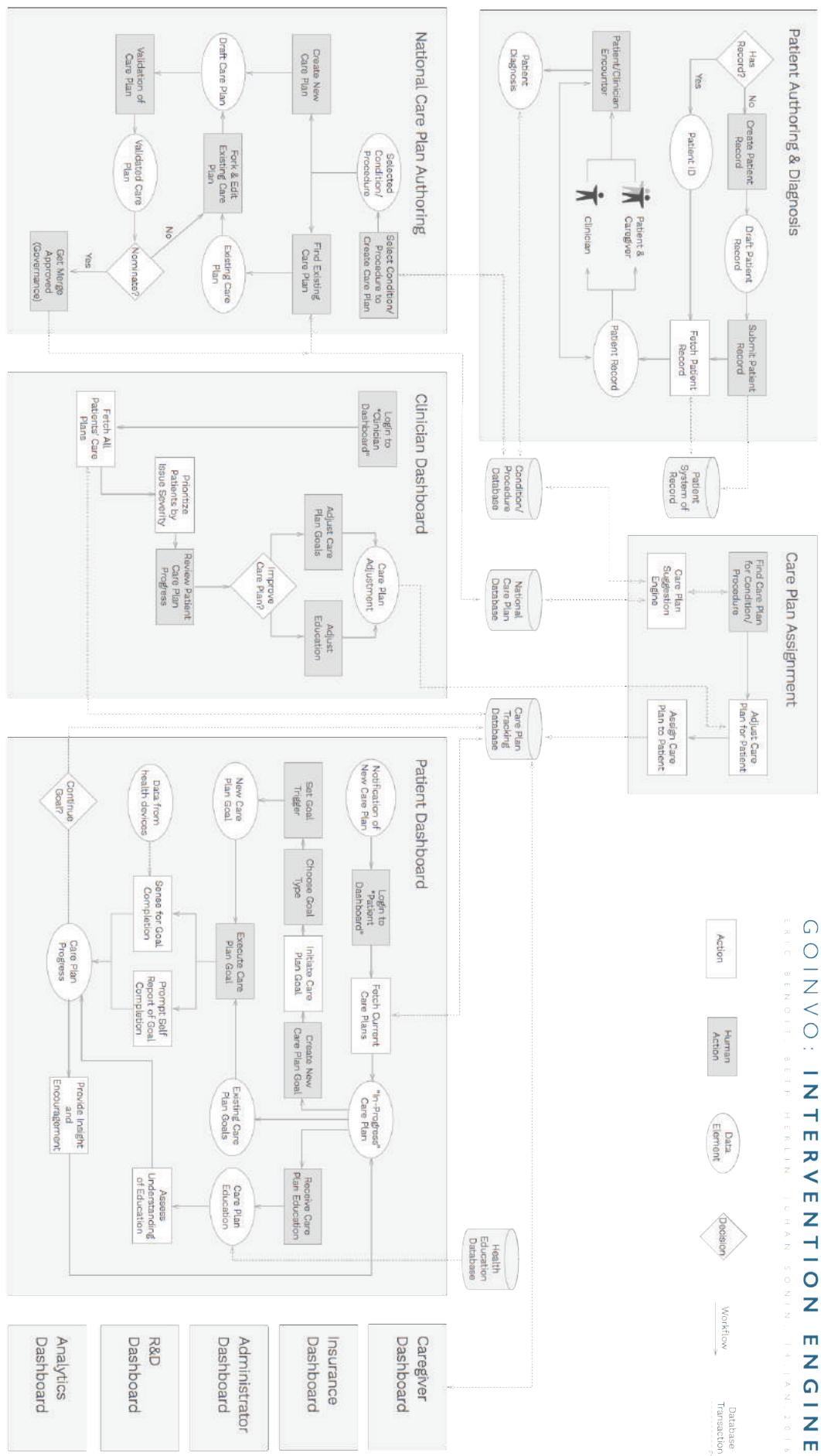
Save New Goal





GO INVO : INTERVENTION ENGINE

ERIC BENOIT, SETH MERLIN, JUHAN SONIN, JAIJAN ZOIS



Appendix 6: Intervention Engine System Diagram

CARE PLANS

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