

# Use of Machine Learning, EHR Design and Reporting to Increase Advance Care Planning Conversations for Patients with Serious Illness

## Stanford Medicine

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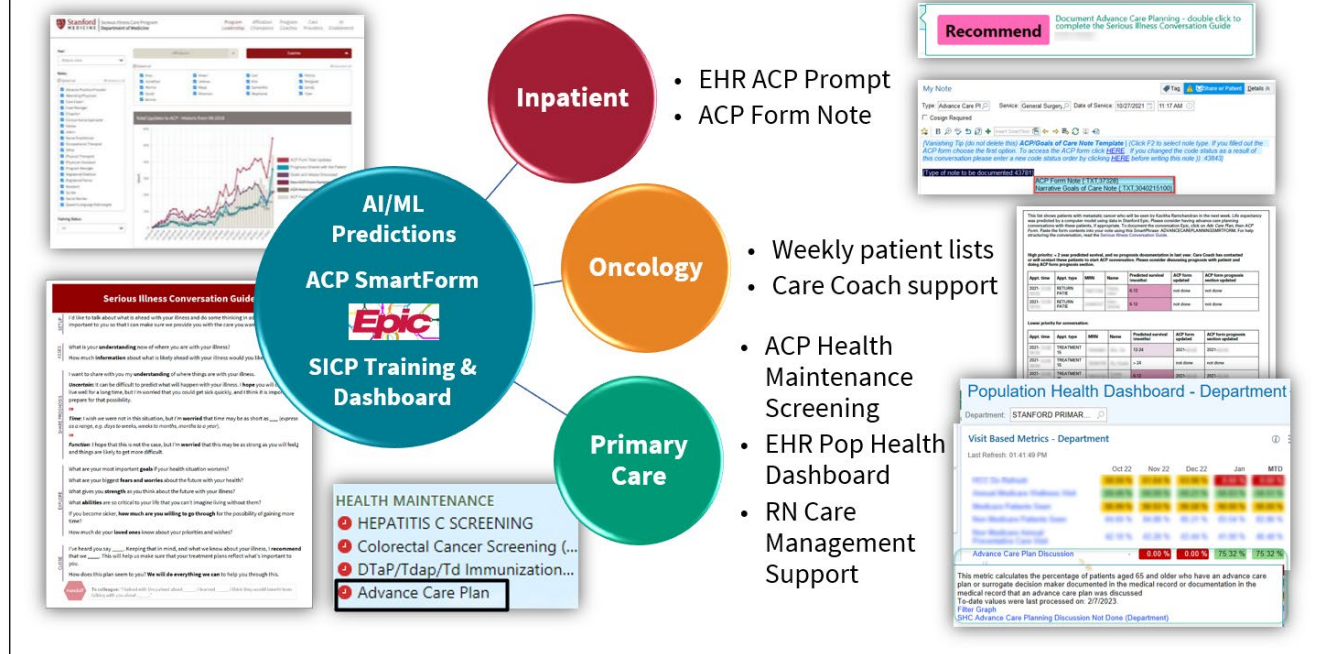
## Executive Summary

Patients with serious illness benefit from meaningful conversations with their providers about prognosis and Advance Care Planning (ACP). ACP helps patients understand and share their goals, values, and preferences, which allows them to receive medical care consistent with those values, especially during serious illness. ACP interventions can improve goal-concordant care and reduce care intensity at end of life (EOL). Patients and physicians agree that ACP is important, but often avoid ACP conversations, as they can be emotionally difficult. Clinicians also cite barriers including lack of time and prognostic uncertainty. ACP documentation rates had been low, even among chronically ill patients including those with cancer. Many patients with cancer have high intensity of care at EOL, which could potentially be reduced with earlier, more frequent ACP discussions.

Stanford Medicine has enabled increased ACP in **inpatient, oncology** and **primary care** settings through a multivariate approach encompassing novel digital innovations, human-centered workflows and analytics including:

1. Artificial intelligence (AI) enabled machine-learning (ML)-generated predictions that power the broader set of ACP digital applications and workflows, serving as a **clinical decision support** (CDS) system within the EHR (i.e., an **AI-enabled system**).
2. Computer learning model-assisted **digital communication pathways** to both physician and nonphysician care team members, highlighting high risk patients in most need of ACP conversations in a standard, structured workflow that empowers care team members to initiate action.
3. **EHR SmartForm**, a shared documentation tool linked to the CDS system, for each care team member to document their portions of the ACP workflow (and see each other's documentation). This ACP form is modeled off the **Serious Illness Conversation Guide** (SICG), a standardized template for ACP using patient-tested language developed by Ariadne Labs.
4. **Serious Illness Care Program**, a care delivery model for enhancing serious illness conversations, to improve the timing and quality of conversations with seriously ill patients to promote goal-concordant care.
5. Nonphysician lay **Care Coach** team members trained to engage with patients in non-prognosis ACP conversations.
6. **Dashboard reporting** for transparency of provider-level ACP engagement.

# ACP Across the Enterprise



In all three settings in which Stanford Medicine deployed these ACP interventions, our initial tripping point and the subsequent critical element conducive to our success were one in the same: the opportunity to design and **implement an AI-enabled system in a manner that is scalable for the health enterprise**. ML predictions had to be usable, simple, integrated into the clinicians' standard work in the EHR, and displayed transparently to all care team members. It was impressed upon adopting clinicians that the role of the AI system was not necessarily to provide *new* information, or to *replace* clinical decision-making, but to function as a dispassionate mediator for facilitating physician and nonphysician collaboration to assess the care plan in light of the new ML-generated information. Stanford Medicine has iterated towards a design that facilitates a **shared mental model** and **collaborative work** across the care team in a manner that promotes structure and transparency.

Our key takeaway was that to remain focused on the concrete improvement goal of **increasing rates of ACP documentation** across the enterprise, we were to view AI, not as the solution, but as an enabling function of the broader system of digital applications, workflows, and human teams.

Favorable patient-centered improvement in care delivery across settings was observed (see outcome data graph in section "*Clinical Transformation enabled through Information and Technology*"), the details of which are included in this case study for further review.

## Define the Clinical Problem and Pre-Implementation Performance

In 2017, Stanford Medicine health system leaders observed that hospital deaths were higher than expected. Moreover, they identified **low rates of documented goals of care conversations with seriously ill patients**, particularly in oncology, as a key driver.


At the end of the preintervention period for oncology (April-May 2020), ten (3%) of 358 patients in the intervention clinics had any ACP documentation and seven (2%) had prognosis documentation at a visit. Of 111 patients seen in control clinics, nine (3%) had any ACP documentation and none (0%) had prognosis documentation.

Targets include **total number of ACP conversations**, as per the ACP SmartForm and total number of conversations with prognosis discussed. See section “*Improving Patient Outcomes*” for a chart illustrating numerator and denominators for pre- and post-implementation performance, within oncology. For inpatient, a specified goal of 10% improvement was defined. For outpatient and primary care, due to the low baseline, outcome performance was simply regarded as an upward improvement sustained over time.

Parameters for inclusion in the model for inpatient, oncology, and primary care are indicated in the below section titled “*Design and Implementation Model Practices and Governance*”. It is to be implied that any patients who do not meet the criteria for inclusion would by default be excluded from the measurement period.

The CMS Quality measure addressed through the initiatives is from the MIPS Program’s Meaningful Use Measure, “*Care is Personalized and Aligned with Patient’s Goals*”. Specifically, concordance with this measure is defined in the below figure.

## CMS Quality Measure



### MIPS Program

**Meaningful Measure Area: Care is Personalized and Aligned with Patient’s Goals**

**DESCRIPTION:**


Percentage of patients aged 65 years and older who have an advance care plan or surrogate decision maker documented in the medical record or documentation in the medical record that an advance care plan was discussed but the patient did not wish or was not able to name a surrogate decision maker or provide an advance care plan.


*AI-enabled ACP workflows, digital communication tools, SICP training and Care Coaches support the enterprise in complying with this CMS Quality Measure.*

Vizient mortality quality measures for oncology were additionally observed. See section “*Improving Patient Outcomes*” for favorable performance detail.


We believe there is great promise for promoting health equity by leveraging AI-enabled workflows in various healthcare applications, and especially in support of advanced care planning. Because our machine learning model makes survival predictions without social, political, economic, and cultural unconscious bias that may exist in human assessment, we believe its inclusion in our ACP workflows provides a supportive mechanism for promoting health equity.

## Promoting Health Equity






**Machine Learning Model**  
makes survival predictions without social, political, economic, and cultural unconscious bias that may exist in human assessment.



**Unified communication**  
and collaboration enabled by broader EHR capabilities, and enterprise-wide training broadens the organization's reach





**Virtual access** to multidisciplinary team members who can assist with ACP expands support to patients outside of the immediate geographical area

### **Design and Implementation Model Practices and Governance**

To resolve the observed low rates of ACP documentation for seriously ill patients, the solution was not only inherently multidisciplinary, but required cross-collaboration amongst disparate departments spanning the health system. Operating within a matrixed enterprise, over the last five years, the following groups have partnered on the ACP interventions reflected in this case study:

## Multidisciplinary Design Governance





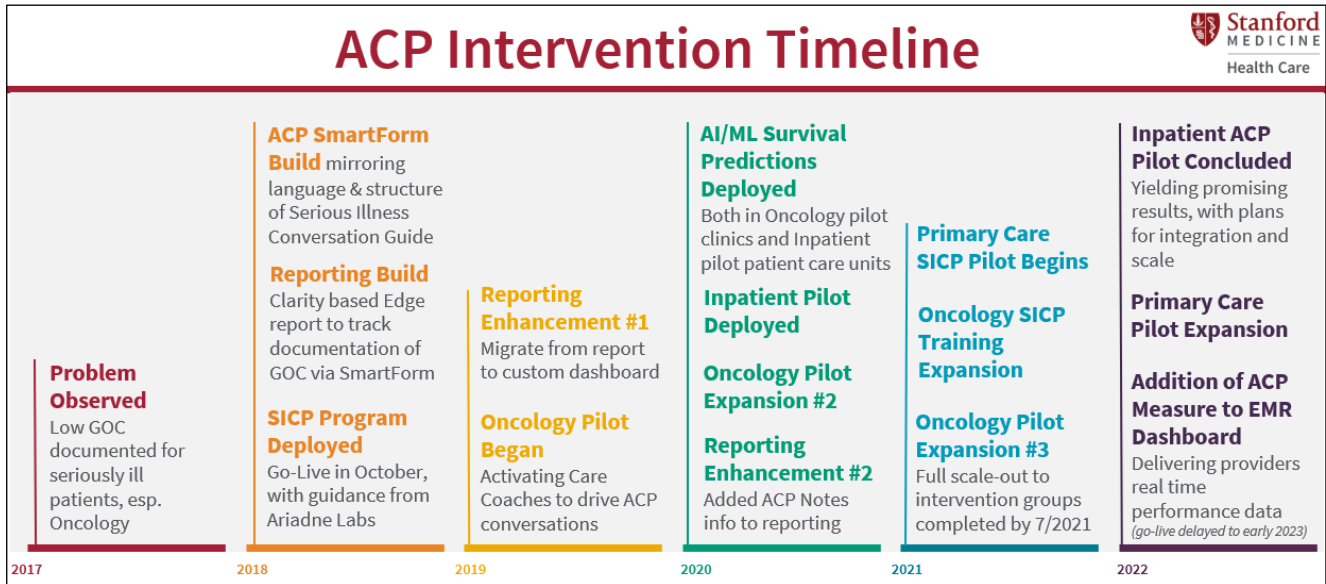
The below timeline illustrates the interwoven nature of each contributing discipline, over time, to the overall effort. For example, the technology and data sciences groups

deployed interventions and enhancements each year from 2018-2022. Moreover, physician champions tied to the SICP groups were engaged in each healthcare settings' rollout of ACP interventions, from oncology to primary care, hospital, and ED.

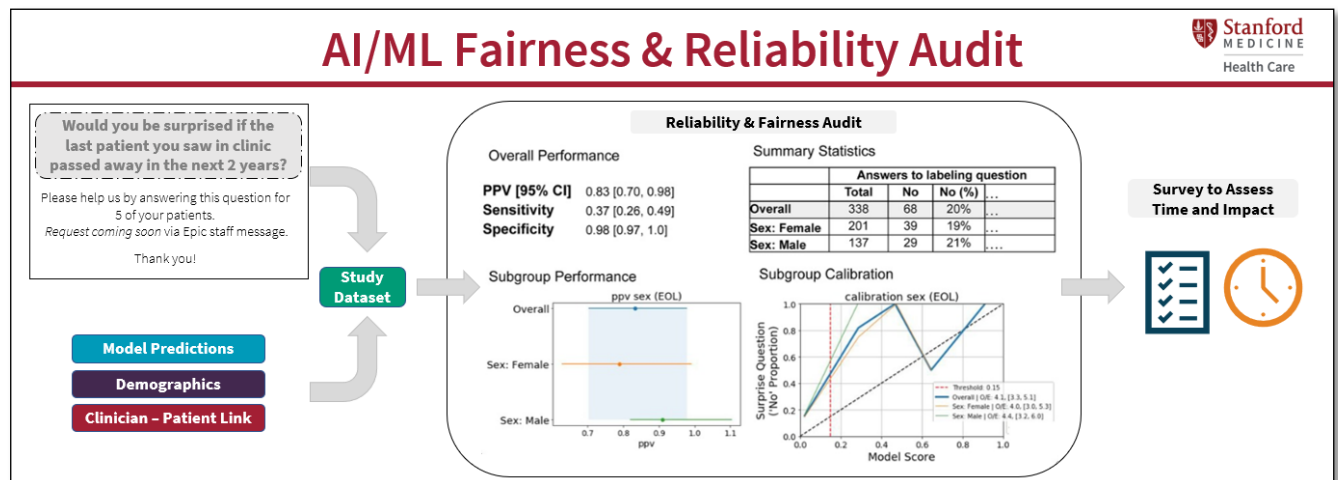
ML/AI predictions, a cornerstone of the ACP workflow which aids physician and nonphysician team members in selecting which patients to prioritize ACP conversations with, is a key part of the design. We will detail here the inclusion criteria for patients observed in the 3 main settings:

- **Oncology Clinics:** metastatic/recurrent/stage 4 cancer with no prognosis previously documented, patient has cancer with distant metastases, age  $\geq$  18 years, scheduled for outpatient follow-up appointment (in person or virtual) in one of the four clinics from April 15, 2020, to February 5, 2021, sufficient data in EHR to run ML model (at least one note, laboratory result and procedure code), no prior prognosis in ACP form, no prior visit in the same week.
  - There were 4,968 clinic visits by 1,251 unique patients that met the inclusion criteria. 1,970 visits were with patients with  $\leq$  2 year predicted survival.
- **Hospitalized Patients:** We aligned on 12-month mortality risk for hospitalized patients as the ML prediction task. Predictions would need to be generated every 24 hours for all admitted patients because the clinical status (and appropriateness of ACP) of hospitalized patients can change over time. We selected a 12-month mortality risk prediction model developed previously by our team that had been validated as an appropriate surrogate for identifying hospitalized patients with serious illness who would benefit from ACP. The classification threshold was selected so that the model flagged patients in the top 25<sup>th</sup> percentile of predicted 12-month mortality risk in a cohort of patients discharged from the inpatient general medicine patients at our institution, which reflected the patient population for this implementation.
  - At this threshold, in a larger validation cohort of 5,965 patients who were admitted to our institution, the positive predictive value was 60% (i.e., 60% of patients flagged by the ML model did, in fact, die within 12 months in the validation cohort).
- **Primary Care:** The patient population for the Advance Care Plan Quality measure includes all patients 65 years and older. Patients who have had a hospice visit in the last year will be excluded from this measure. There are multiple ways to satisfy the ACP measure: Documentation of an ACP discussion or inability to discuss (.ACPDISCUSSION, ACP Smartform, AWV) OR having an ACP document in Epic (Living Will, POLST, Adv. Directive, DNR, DPOA).
  - ACP discussion is documented annually, and when an ACP document is uploaded to the chart, it will count that year and every year thereafter. However, it is important to periodically check with the patient whether the document needs to be updated.
  - FY22 target ACP for Primary Care Division was 45%; actual outcome was 54%

Workflow designs referenced in this case study were field tested and iterated, as reflected in the below intervention timeline.



Much of our learnings, particularly with the evolution of our AI/ML model, are reflected in the following section “Improving Adherence to the Standard of Care”. Importantly, to have trust in a system so well-integrated with AI/ML, specifically with survival predictions suggesting the prioritization of patients with whom to engage for ACP, we underwent thorough fairness and reliability audits of our AI/ML model. Specifically, we conducted a reliability audit of our ML model based on performance and calibration, as well as a fairness audit based on summary statistics, subgroup performance, and subgroup calibration.



10 clinicians were surveyed after a presentation summarizing the audit. 10/10 reported that summary statistics, overall performance, and subgroup performance would affect their decision to use the model to guide care; 9/10 said the same for overall and subgroup

calibration. This audit required 115 person-hours across 8–10 months. Our recommendations for performing reliability and fairness audits include verifying data validity, analyzing model performance on intersectional subgroups, and collecting clinician-patient linkages as necessary for label generation by clinicians.

We believe those responsible for AI models should require such audits before model deployment and mediate between model auditors and impacted stakeholders. Our work may support others in implementing routine reliability and fairness audits of models prior to deployment into a practice setting.

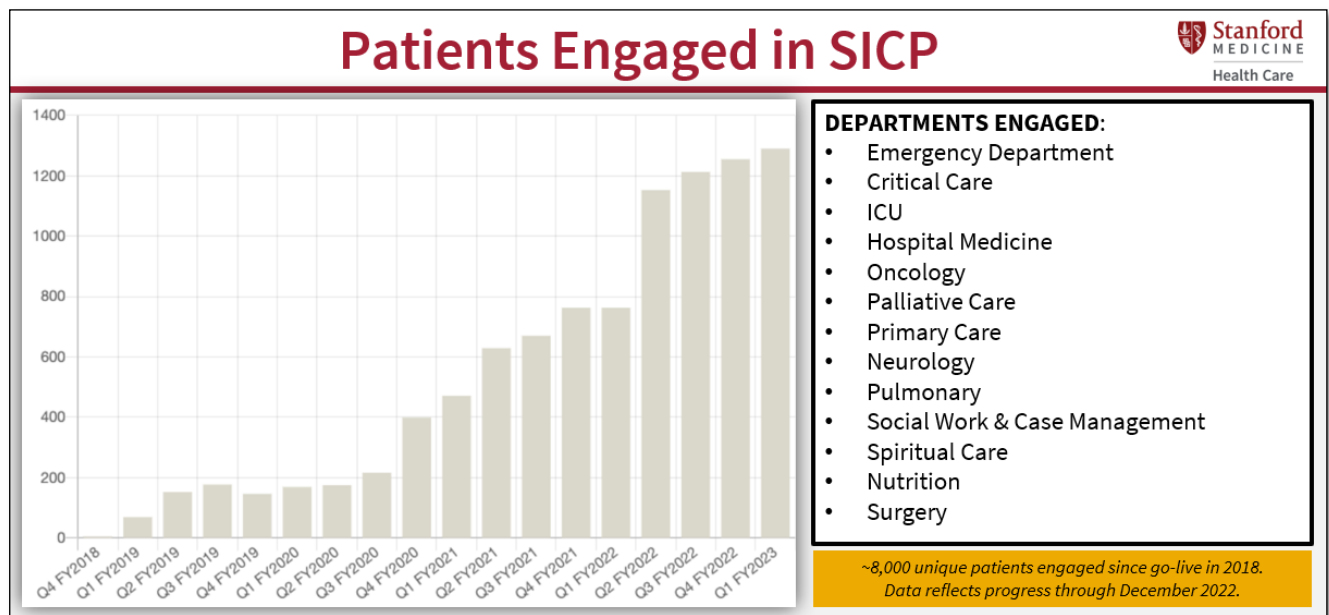
Viewing the above descriptors of ML/AI criteria as part of the model practice **design**, the next section of this case study further details the specific clinical IT **interventions** deployed and adopted through this 5-year effort.

### Clinical Transformation enabled through Information and Technology

To address barriers to ACP for patients with serious illness, in 2018, Stanford Medicine **implemented the Serious Illness Care Program (SICP)** to train 800 clinicians across 10 disciplines to use a structured guide during patient conversations.

Stanford University's department of Medicine, using Quality funds, signed a contract with Ariadne Labs and funded our participation in a 7-member healthcare system SICP implementation collaborative hosted by Ariadne Labs.

As of December 2022, ~8,000 unique patients were engaged with the SICP program.



Prior to go-live of SICP in 2018, we **built a custom ACP SmartForm** in our EHR (Epic), accessible through the ACP Navigator that mirrored the language and structure of the Serious Illness Conversation Guide (SICG). This standardized template for ACP used patent-tested language developed by Ariadne Labs.



# SICG Built into ACP SmartForm

### Serious Illness Conversation Guide

I'd like to talk about what is ahead with your illness and do some thinking in advance about what is important to you so that I can make sure we provide you with the care you want. **Is that okay?**

What is your **understanding** now of where you are with your illness?  
How much **information** about what is likely ahead with your illness would you like from me?

I want to share with you my **understanding** of where things are with your illness.  
**Uncertainty:** It can be difficult to predict what will happen with your illness. I **hope** you will continue to **live well** for a long time, but I'm worried that you could get sick quickly, and I think it is important to **prepare** for that possibility.

**Time:** I wish we were not in this situation, but I'm **worried** that time may be as short as \_\_\_\_ (express as a range, e.g., days to weeks, months to a year).

**Function:** I hope that this is not the case, but I'm **worried** that this may be as strong as you will feel and things are likely to get more difficult.

What are your most important **goals** if your health situation worsens?  
What are your biggest **fears and worries** about the future with your health?  
What gives you **strength** as you think about the future with your illness?  
What **abilities** are so critical to your life that you can't imagine living without them?  
If you become sicker, **how much are you willing to go through** for the possibility of gaining more time?  
How much do your **loved ones** know about your priorities and wishes?

I've heard you say \_\_\_\_ keeping that in mind, and what we know about your illness, I **recommend** that we \_\_\_\_ This will help us make sure that your treatment plans reflect what's important to you.

How does this plan seem to you? **We will do everything we can** to help you through this.

**Conclusion:** To colleagues: "I talked with the patient about \_\_\_\_ I learned \_\_\_\_ I think they would benefit from talking with you about \_\_\_\_"

### Goals of Care/Advance Care Planning

#### Advance Care Planning Form

**Goal of Care/ACP Notes SmartForm**  
This is a dynamic document that is used by many members of the care team and may contain information from prior encounters. For more information on how to use this form, click User Instructions.

Documented Date/Time: [Calendar icon] [Clock icon] Now

Documented by: [Search icon]

Discussion Participants:  Patient  Surrogate(s)  Other attendee(s)

Patient illness understanding

What is your understanding of where you are with your illness?

Information sharing

How much information about what is likely ahead with your illness would you like to have?

Prognosis shared with the patient

ACP SDEs included in ACP documentation  
Easily pulls ACP Form into ACO Notes

- ✓ Anchored into Advance Care Planning Navigator
- ✓ Fits into the sequence of user workflow from ACP Form to ACP Notes
- ✓ Conversation with Patient documented

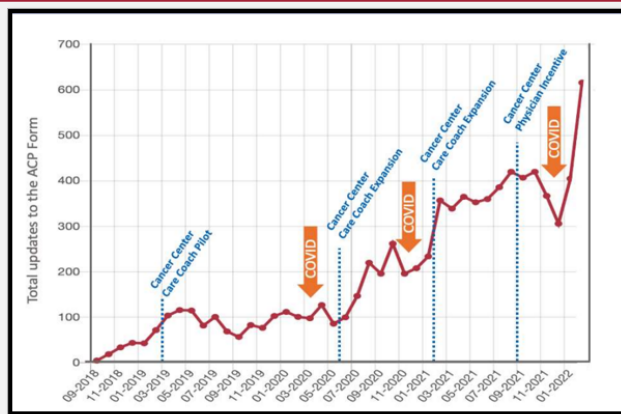
Additionally, we **created a custom Clarity-based Edge report** to be able to track documentation of Goals of Care from the ACP SmartForm, in order to measure our outcome goal of increasing the **total number of ACP conversations**. For more detail, refer to the later section "Accountability and Driving Resilient Care Redesign".

Despite training and a standardized method to document patient ACP discussions in the EHR, rates of ACP remained low in the early stages of the pilot. At that juncture, literature indicated that support from lay health workers in ACP had been shown to improve patient satisfaction and reduce high-intensity care, and could be a catalyst for provider engagement (see references at end). Accordingly, the **Care Coach role was introduced** to the oncology pilot. See the below chart reflecting the increase in ACP SmartForm utilization with each introduction of a Care Coach to an ACP intervention oncology clinic.

# ACP SmartForm Utilization

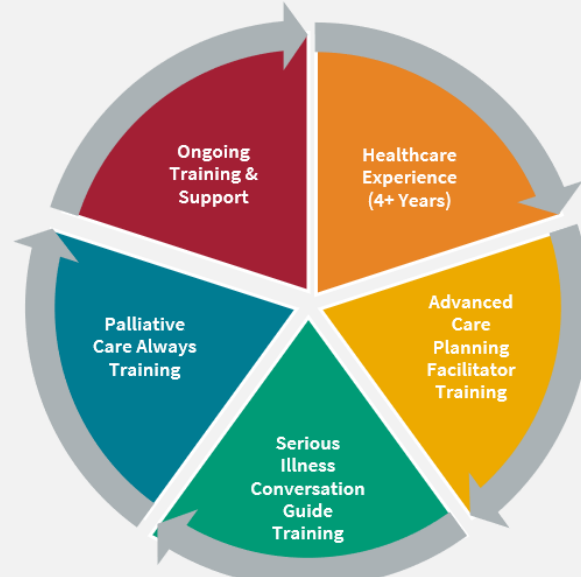
*Enhancements to SmartForm and ACP Note have allowed for a more streamlined workflow across clinical disciplines*

*Documentation of ACP conversations using our workflow continued to grow, driven by growth in QI initiatives to support participation and despite setbacks related to the COVID-19 pandemic*



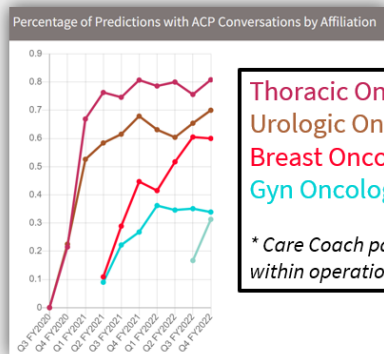
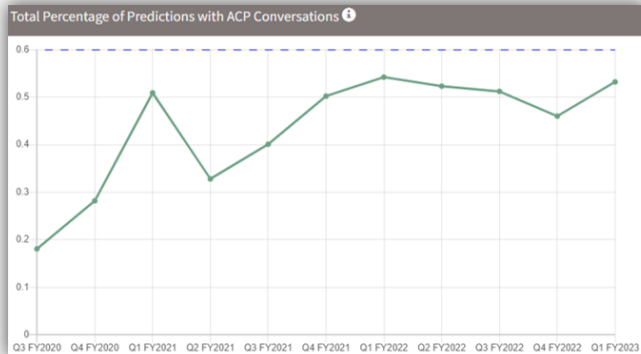
# Care Coach Role

- **Care team members** trained to support Advanced Care Planning for our cancer patients.
- Helps **facilitate communication** between the patients, their loved ones, and the care team and **empower patients** to advocate for their care preferences.
- Completes ACP documentation in EMR
- Supports patients in completing Advanced Directives.
- Works closely with clinical teams to support patients and has clear hand-offs to and from clinical team.



# Care Coach Impact

Care coaches are conducting a significant volume of ACP conversations with patients around goals, values and family understanding.



Thoracic Oncology – full\*  
 Urologic Oncology – full\*  
 Breast Oncology – partial\*  
 Gyn Oncology – partial\*  
 \* Care Coach participation level within operation

Cancer Center ACP Conversations Calendar Year to Date	Distinct Patients	Prognosis	Goals & Values Discussed	Family Understanding
Cancer- Care Coaches	411	19	485	372
Cancer - other Users	2467	2368	509	245
<b>% Care Coaches</b>	<b>14%</b>	<b>1%</b>	<b>49%</b>	<b>60%</b>

Cancer Mortality Reviews Jan 2020-Sep 2023	Entire cohort (441)	Care Coach Cohort (42)
ACP Form Edited Prior to Admission	24%	98%
Code Status Upon Admission: Full Code	77%	63%
Palliative Care Interaction (Ever)	67%	84%

ACP Data Source: SICP Dashboard  
 Predictions = patients identified by ML model with < 2 predicted survival

In the following, we will detail the clinical workflow for **oncology**, inclusive of touchpoints where information and technology drives improved adherence to the ACP standard of care:

- Providers (attending physicians and APPs) in four oncology clinics (genitourinary, thoracic, cutaneous, and sarcoma) at Stanford Health Care completed SICP

training in 2018-2019. They were asked to document ACP conversations in a custom ACP form in the Epic EHR, which was a living document whose contents were visible to all users and could be updated at any time. Advance directives and Physician Orders for Life-Sustaining Treatment were done on paper and scanned into the EHR.

- In the two intervention clinics (genitourinary and thoracic), lay care coaches were hired and completed training in oncology, ACP, and palliative care. The care coaches contacted patients via electronic portal or phone call and invited them to have an ACP conversation over the phone. They discussed all elements of the Serious Illness Conversation Guide with patients (except for prognosis) and documented in the ACP form.
- After the conversation, they pasted the ACP form contents into a note and passed along any questions more appropriate for a clinical care provider to the oncology provider whose clinic visit date fell closest to the conversation date. Variably, the care coach would forward the note to the provider in the EHR (depending on provider preference). Providers were then expected to complete the discussion by reviewing prognosis with these patients. Alternatively, the provider could start the conversation including prognosis, and then refer the patient to the care coaches to complete the conversation or complete the entire conversation themselves.
- From June 7, 2020, providers in the two intervention clinics have received weekly e-mails on Sunday night containing a list of upcoming clinic patients for the next week with metastatic cancer. Metastatic diagnosis was automatically determined using the EHR's cancer staging module and International Classification of Diseases-10 codes. A previously described ML model was used to automatically predict median survival time for each patient. Predictor variables included text of provider notes and radiology reports, laboratory values, vital signs, and others. The survival predictions were binned into 0-6, 6-12, 12-24, and 24 months and included in the e-mails. For patients with a 2-year predicted survival and with no prognosis, documentation from the ACP form over the last year was included in a high-priority section. Providers were asked to discuss prognosis with these patients and document that discussion in the ACP form, and care coaches contacted these patients to conduct the other parts of the ACP conversation. Support staff flagged high-priority patients on a daily electronic whiteboard. Providers were educated about the ML model's limitations and were advised not to use it to make treatment decisions. The care coaches did not contact patients in the cutaneous and sarcoma clinics (control group).

# Sample Patient List Email

Serious Illness Conversation Guide is hyperlinked for provider's quick reference

Higher priority conversations based on survival prediction, absence of documented prognosis, absence of ACP form

Lower priority but suggested ACP list driven by AI/ML

This list shows patients with metastatic cancer who will be seen by Kavitha Ramchandran in the next week. Life expectancy was predicted by a computer model using data in Stanford Epic. Please consider having advance care planning conversations with these patients, if appropriate. To document the conversation Epic, click on *Adv Care Plan*, then *ACP Form*. Paste the form contents into your note using this SmartPhrase: `ADVANCECAREPLANNINGSMRTFORM`. For help structuring the conversation, read the Serious Illness Conversation Guide.

High priority: < 2 year predicted survival, and no prognosis documentation in last year. Care Coach has contacted or will contact these patients to start ACP conversation. Please consider discussing prognosis with patient and doing ACP form prognosis section.

Appt. time	Appt. type	MRN	Name	Predicted survival (months)	ACP form updated	ACP form prognosis section updated
2021-...	RETURN PATIE	...	...	6-12	not done	not done
2021-...	RETURN PATIE	...	...	6-12	not done	not done

Lower priority for conversation:

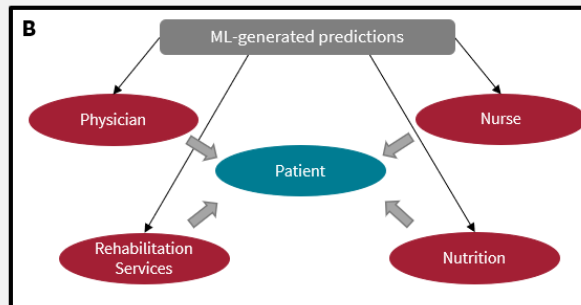
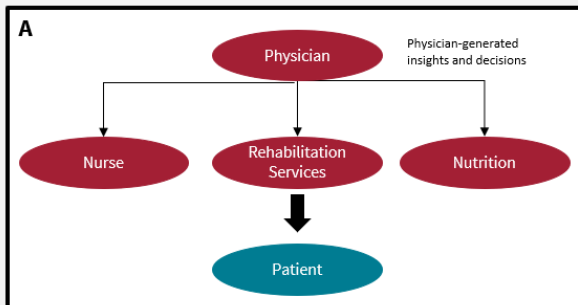
Appt. time	Appt. type	MRN	Name	Predicted survival (months)	ACP form updated	ACP form prognosis section updated
2021-...	TREATMENT 15	...	...	12-24	2021-...	2021-...
2021-...	TREATMENT 15	...	...	> 24	not done	not done
2021-...	TREATMENT 15	...	...	6-12	2021-...	2021-...

- The cutaneous and sarcoma clinics were used as control clinics because their providers had all received training in SICP and the ACP form, so we could assume that almost all ACP conversations were documented in the ACP form.

As illustrated in the ACP Intervention Timeline, ACP workflows were deployed in the inpatient setting (general medicine units) separate from the oncology pilot. Both settings received the support of AI-enabled digital workflows, communication pathways, and SICP. Workflow differentiators include varying makeup of care team members (ex: Care Coaches in oncology clinics only) and differing primary methods of receiving AI/ML patient prioritization (ex: weekly emailed lists vs. EHR flagging).

# Collaborative Workflow Enabled by AI

Our traditional hierarchical workflow (A) involved physicians generating insights and decisions that were then passed down to the rest of the care team and the patient.



We envisioned an AI-enabled system (B) in which machine learning (ML)-generated predictions empower and guide each member of the care team to initiate and carry out decisions in a more democratized and collaborative manner while removing the bottleneck at the physician level.

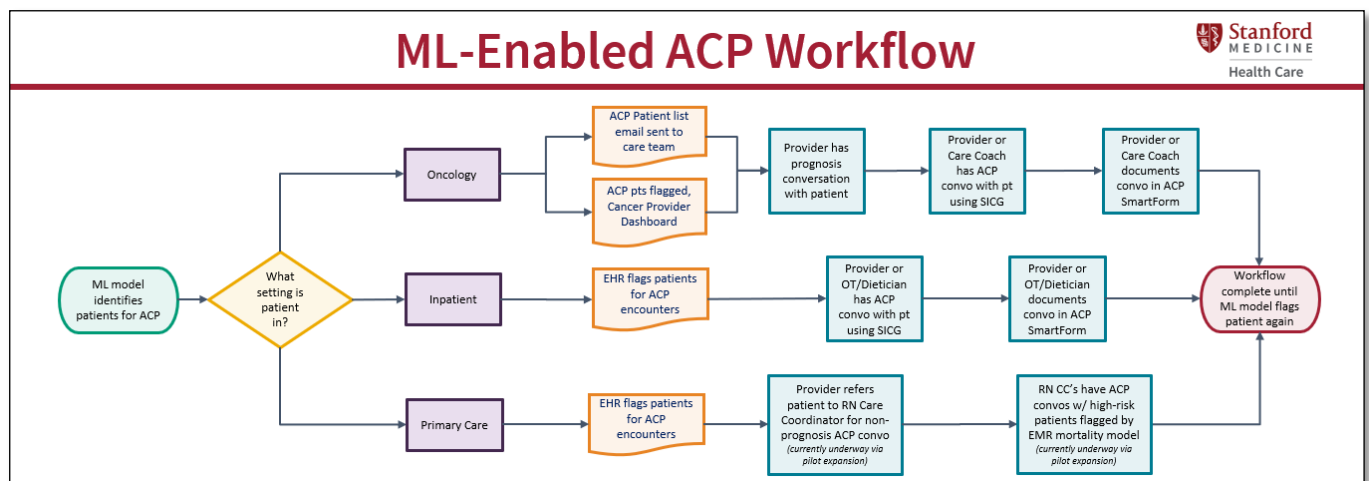
# EHR Design for Communicating ML Predictions

A **patient list column** in the EHR was created for the ACP implementation that could be added by both physicians and nonphysician team members to their **daily patient lists**.

A **flag** is displayed **when recommended by the machine-learning model**, along with a simple message prompt to document advance care planning.



To further illustrate the implementation alignment and differentiators across settings, a longitudinal workflow for the enterprise is included below.

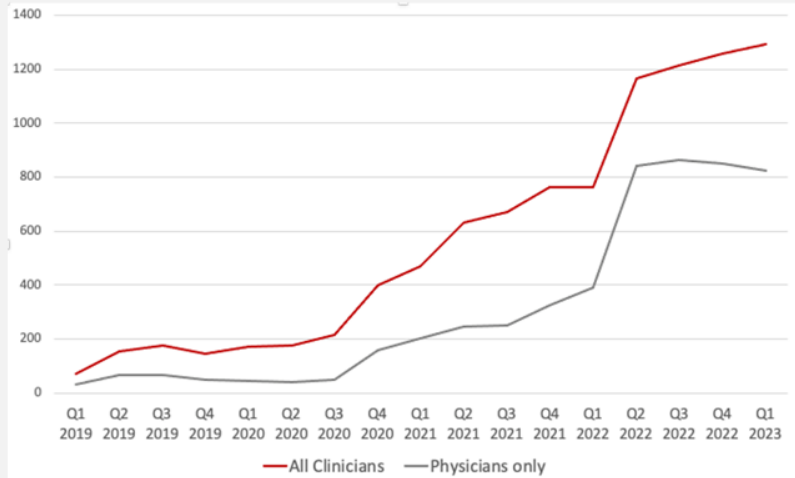


A brief overview of the clinical transformation enabled through these technologies from the **inpatient** setting is as follows:

- Implementation initiated & tested on pilot patient care units in July 2020, and followed a Plan, Do, Study, Act (PDSA) cycle.
- For ACP, we established a target of 10%, given the higher number of expected flagged encounters, the amount of time needed to complete ACP conversations, and the relatively lower urgency of the intervention for an inpatient encounter.
- The ACP pilot was implemented for all patients admitted to the general medicine inpatient service, which thus far has included 11,881 total patient hospital encounters since the beginning of the implementation (July 2020) to January 2022 (average of 625 encounters per month), with 2,627 patient encounters flagged by the ML model as candidates for ACP (138 per month; 22% of total encounters).

# Multidisciplinary Increase in ACP

Graph at right shows total unique patients engaged by all clinicians (red) compared with physician only conversations (gray) illuminating the **significant contribution by non-physician team members, whose participation is facilitated by the algorithms.**



## Improving Adherence to the Standard of Care

Preintervention, Stanford Medicine's documentation rate for ACP Goals of Care was significantly low. As mentioned, 3% of Oncology clinic patients had ACP documentation during a visit. It is shown in our EHR data of ACP documentation that ACP conversations have steadily and significantly increased over time. Please see the bar charts in section "Improving Patient Outcomes" for numerator and denominator detail. The method of data collection for populating these measures was extraction from the EHR.

We attribute the sustainable improvement of adherence to the standard of care in ACP documentation to our **operational design**. By leveraging AI-enabled workflows and care team-designed processes, adherence becomes part of normal operations.

## Standard of Care By Operational Design

**Serious Illness Care Program:**  
Providers (MDS & APPs) are given tools and training to have productive conversations about prognosis and ACP and how to document in the medical record.

**Machine Learning Model:**  
The machine learning model uses Epic data to identify seriously ill patients who are at high risk for mortality and in most need of ACP conversations.

**Care Coach Program:**  
Care Coaches facilitate communication between patients & care team; empower patients to advocate for their care preferences; and complete the ACP SmartForm.

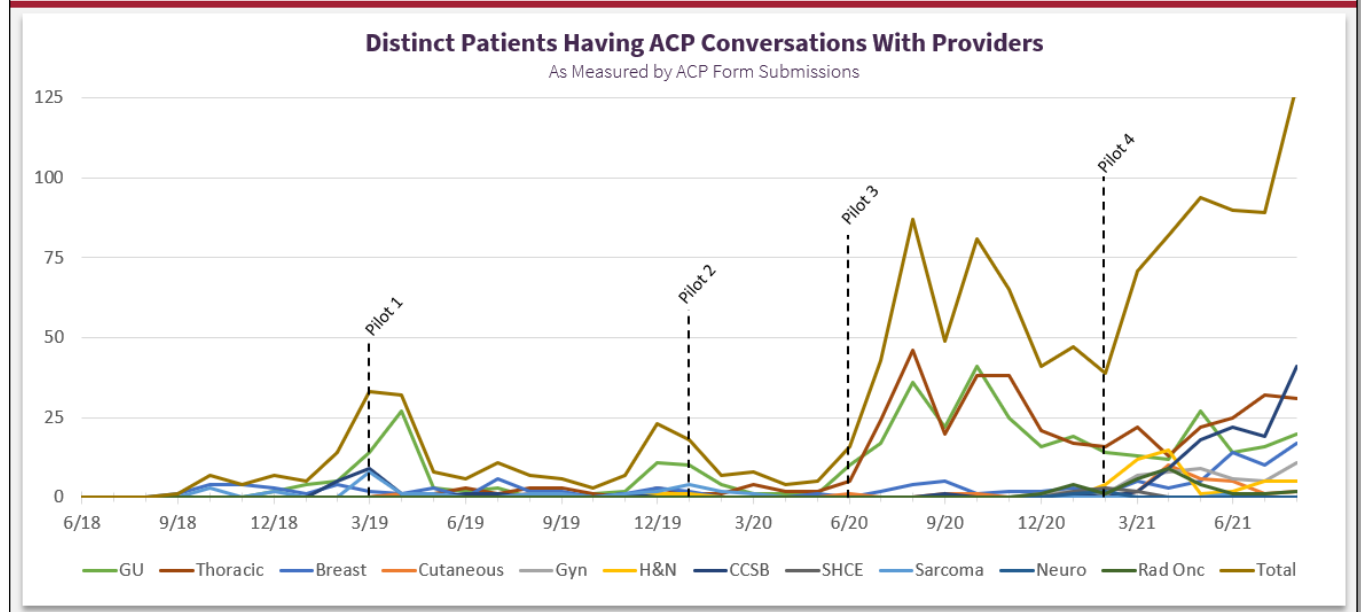
**Standard of Care Goal:**  
Patient and provider to have a meaningful conversation about prognosis and Advance Care Planning (ACP) to better understand and provide care consistent with their values, goals, and preferences. The discussion and prognosis are documented in the EHR and accessible to all users across the enterprise.

Although ACP standard of care adherence is well-integrated into our operations today, we must impress upon other organizations wishing to adopt this model, that the suite of interventions has undergone much iteration, and was itself a deep learning journey.

We will share some insights from the learnings and evolution of our ML model, for example:

- Our institution implemented a lay navigator-led and/or care coach-led ACP intervention in early 2019 to initiate ACP conversations. During a rollout in the genitourinary medical oncology clinic, there was an increase in ACP documentation driven by the care coaches, but lack of sustained engagement and documentation by providers. A challenge uncovered was that the **eligibility criteria** defined by oncology clinicians were **narrow** (e.g., patients with progressive metastatic disease starting late line treatment) and **required time-intensive reviews** by care coaches to identify appropriate patients.
- We hypothesized that we could optimize patient selection for ACP conversations and improve confidence in the process by using a tool that could accurately predict the patients to be prioritized. We had previously developed a machine learning (ML) model that uses thousands of EHR variables to automatically predict life expectancy for patients with metastatic cancer. It was found to perform much better than a traditional prognostic model, and at least as well as the treating physician. In addition to aiding in patient selection for ACP, **sharing ML model results with providers** enhanced their confidence in their prognosis estimation and willingness to discuss prognosis with patients.
- One trial found that using a ML model to **prioritize patients for ACP** resulted in **more conversations**. That trial did not include lay health workers, so it did not address how to operationally integrate the ML model with care coaches. We conducted a pilot implementation in which two oncology clinics began to use our ML model to select patients for ACP conversations by care coaches and providers. Two other clinics served as controls; providers in those clinics had undergone SICP training but did not have access to care coaches or the ML model. The primary outcome was the rate of prognosis documentation by providers. This metric **quantified provider engagement** and was important because providers' support of care coaches is critical to building patients' trust in the staff and increasing participation.

# Provider Engagement with ACP



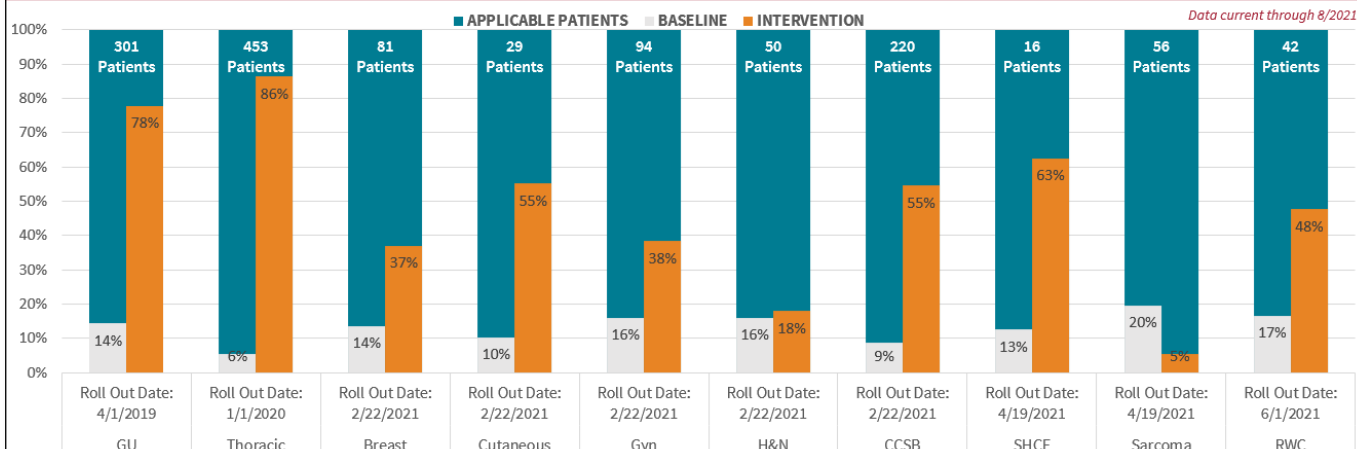
- The analysis included clinic visits from April 2020 (when we began to receive detailed patient data that allowed us to make ML predictions) until early February 2021, as there was a wider rollout of the intervention thereafter to more oncology clinics, including the control clinics.
- The ML model implementation was reliable, and all weekly e-mails containing the predictions were sent successfully.
- After the start of the intervention, there was progressive and sustained uptake of ACP form edits by providers in the intervention clinics. For intervention clinic patients who were identified as high priority on a weekly e-mail and subsequently had prognosis documentation by an intervention clinic provider, median time from first e-mail to first prognosis documentation was 65 (IQR, 23-152) days.

## Improving Patient Outcomes

**Improvement in ACP conversations** held and documented was the primary objective of these intervention efforts. As evidenced by the below data, improvements in ACP for 90% of the oncology intervention cohorts was notable.



## ACP % - Baseline vs. Intervention



**Applicable Patients** - Patients identified with metastatic cancer with a life expectancy of 2 years or less. Patients excluded from the denominator are those that have been referred to hospice, moved away, receiving care outside of SHC, or deceased **prior to intervention**.

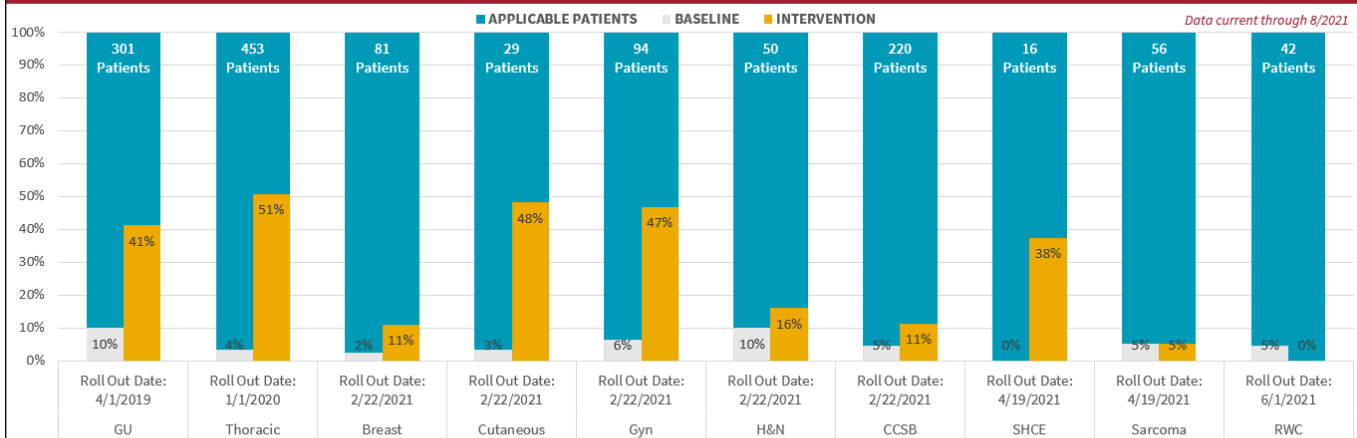
**Baseline** - Baseline ACP data is collected at the time a patient is screened in to show any ACP discussions that occurred prior to care coach intervention.

**Intervention** - Any ACP conversations that were initiated after the screen date.

**ACP Conversations** can be initiated by any person including, but not limited to, inpatient care team, outpatient care team, spiritual care, and Care Coaches.

A meaningful byproduct of the ACP focus of this initiative was an **increase in prognosis conversations** held between patients and their providers. The below data shows a notable increase in prognosis conversations held for 80% of the oncology clinics that were part of the ACP intervention cohorts.

## Prognosis % - Baseline vs. Intervention



**Applicable Patients** - Patients identified with metastatic cancer with a life expectancy of 2 years or less. Patients excluded from the denominator are those that have been referred to hospice, moved away, receiving care outside of SHC, or deceased **prior to intervention**.

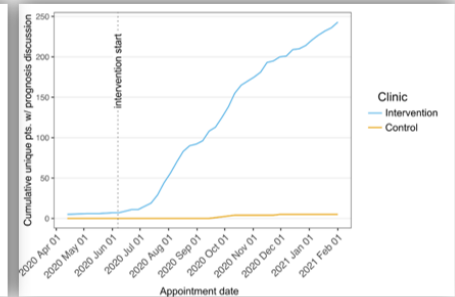
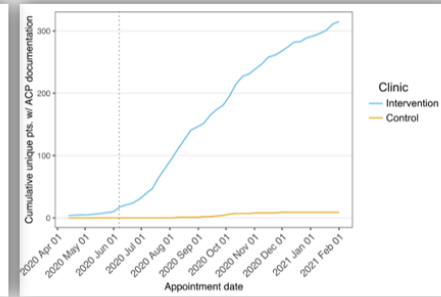
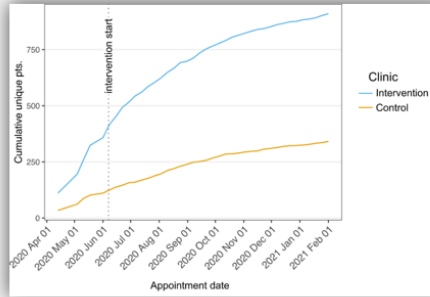
**Baseline** - Baseline ACP data is collected at the time a patient is screened in to show any ACP discussions that occurred prior to care coach intervention.

**Intervention** - Any ACP conversations that were initiated after the screen date.

**Prognosis conversations** are exclusively covered by the providers and are not discussed by the care coaches.

To further illustrate the impact of the interventions reflected in this case study, on both ACP and prognosis discussions in oncology intervention clinics as compared to control, please refer to the below illustration.

# ACP & Prognosis Documentation



Weekly cumulative number of study-eligible patients meeting various criteria seen in intervention vs. control clinics.

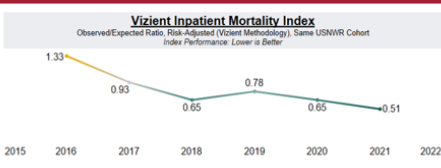
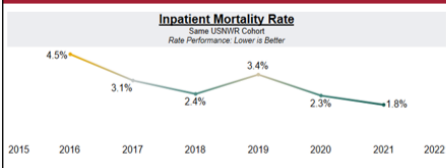
ACP documentation was done by both Care Coaches and providers; prognosis documentation was only done by providers.

**Intervention Cohort:** Thoracic Oncology and Genitourinary Oncology clinics

**Control Cohort:** Sarcoma and Cutaneous Oncology clinics

To assess the broader impact on the patient population by increasing ACP documentation for seriously ill patients, we looked towards Vizient's benchmarked mortality quality measures. During the pilot, the entire Vizient Oncology Product Line performance of ACP completed was just 3.7%, as compared to the significantly favorable outcome for the ACP pilot cohort of 25.1% ACP completed. Additionally, the Vizient Inpatient Mortality Index was significantly lower (favorable) for the ACP pilot cohort (0.54) compared to the entire Oncology group measured (0.74).

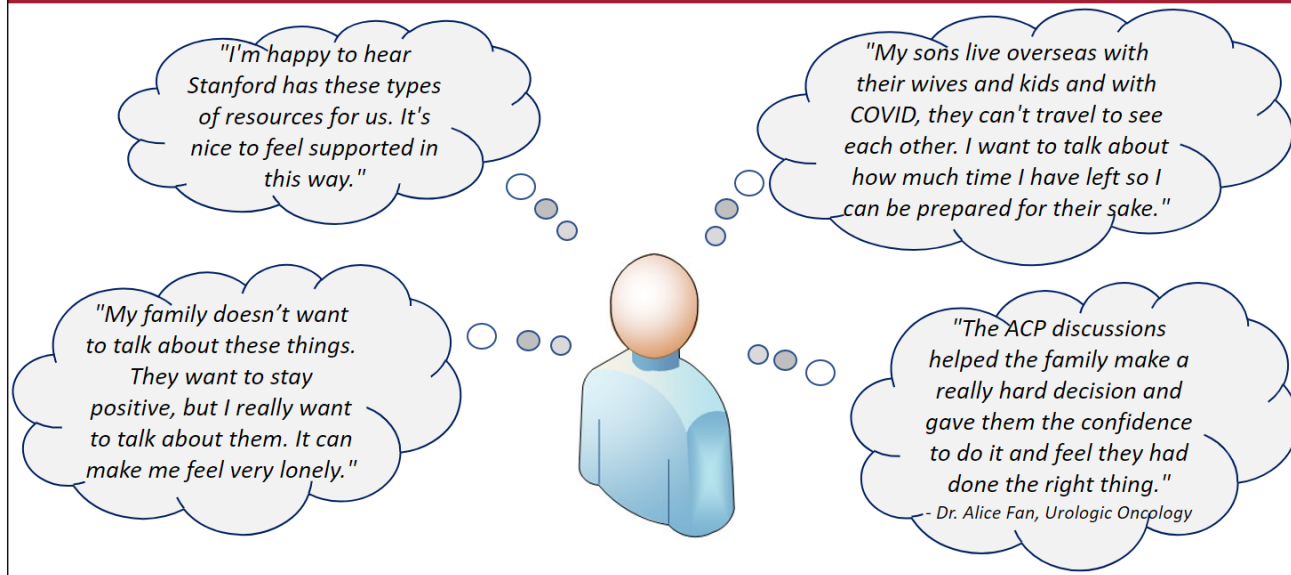
# Vizient Mortality Quality Measure



VIZIENT Oncology Product Line vs. Oncology ACP Pilot Panel FY21: 9/1/20 - 6/17/21		
	VIZIENT	ACP Pilot
# Inpatient Encounters	3028	455
# Unique Patients	2488	346
# On ACP Pilot Panel	144	346
# / % ACP Completed	92 / 3.7%	87 / 25.1%
# / % Expired at SHC	77 / 3.1%	17 / 4.9%
# / % Expired Elsewhere	253 / 10.2%	100 / 28.9%
Mortality Index	0.74	0.54

Stanford Medicine aims to put the patient at the center of everything it endeavors to do, not solely in terms of outcomes, but by engaging them in the process as well. We interviewed patients and their providers to look beyond the quantitative and understand firsthand how the promotion of ACP practices within our operational workflows was being **received by the patients** themselves. Below is a sample of their feedback.

## Patient Stories and Provider Feedback



### Accountability and Driving Resilient Care Redesign

To provide close to **real-time performance data** to providers and support our efforts to increase ACP enterprise-wide, we created a custom Clarity-based Edge report. This report enables us to track documentation of Goals of Care from the ACP SmartForm, in order to measure the total number of ACP conversations held.

## ACP Reporting Build

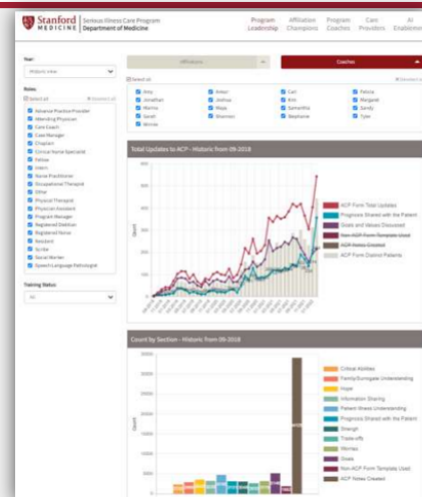
### OBJECTIVE:

Use ACP SmartForm, SmartPhrases and ACP Notes to measure activity related to ACP conversations being conducted with patients

### METHOD:

- ✓ Built SDEs into Smartform that allows us to track if the form was updated, by who and which sections
- ✓ Used Clarity view V\_SMRTDTA\_ELEM\_VAL\_ALL which combines current values for SmartData elements

*Report provides end users essential information to measure, take action & assess results for program changes. Importantly, it increases organizational communication and collaboration.*



In Oncology, a provider dashboard was built into the EMR. Identification of patients missing ACP prognosis documentation is a prominent feature, further facilitating the increase in ACP for patients in most need.

# ACP on the Cancer Provider Dashboard

Primary Care has an upcoming avenue for driving accountability with ACP discussions, which is the Population Health Dashboard already built into the EHR. This dashboard offers providers an at-a-glance snapshot of key population health measures such as cancer screenings, tobacco use screenings, and annual wellness visit tracking. The CMS measure for ACP is scheduled to feature on this dashboard in early 2023.

# Population Health Dashboard in EHR

Measure excludes patients who received hospice in the last 12 months

ACP discussion is documented annually, and when an ACP document is uploaded to the chart, it will count that year

Hover-over feature gives providers verbiage of the ACP metric measurement



	Oct 22	Nov 22	Dec 22	Jan	MTD
HCC Dx Refresh	75.32%	75.32%	75.32%	75.32%	75.32%
Annual Medicare Wellness Visit	75.32%	75.32%	75.32%	75.32%	75.32%
Medicare Patients Seen	75.32%	75.32%	75.32%	75.32%	75.32%
Non Medicare Patients Seen	75.32%	75.32%	75.32%	75.32%	75.32%
Non Medicare Annual Preventative Care Visit	75.32%	75.32%	75.32%	75.32%	75.32%
Advance Care Plan Discussion	-	0.00%	0.00%	75.32%	75.32%

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## **HIMSS Global Conference Audience – Main 3 Relevant Topics**

1. Healthcare Applications and Technologies Enabling Care Delivery
2. Clinical Informatics and Clinician Engagement
3. Data Science/Analytics/Clinical and Business Intelligence