Health Heritage is a patient-facing, web-based application that empowers consumers to collect, analyze and share their detailed personal & family health histories. Health Heritage establishes a “living legacy” for children and future generations and can also be a vital and unique addition to research consortiums and biobanks.
Health Heritage: History

• Developed as NCI-funded research project at University of Virginia: 2010-11

• Launched at NorthShore University HealthSystem: May, 2014
  • 4 hospitals & 2,000 clinicians in northern Chicago suburbs; Epic EMR; Available to all patients through a link in their patient portal
  • Clinical validation published in *Familial Cancer* 2015; 15:331-339 demonstrating agreement (97%) between Health Heritage’s referral for genetic evaluation versus a genetics team relying on guidelines and expertise.
  • Patients are now independently scheduling appropriate genetic evaluations and other preventative services based on Health Heritage recommendations.

• Acquired by NantHealth, a precision cancer care company: Sept, 2015

Founded and led by Dr. Patrick Soon-Shiong  
[www.nanthealth.com](http://www.nanthealth.com)
Health Heritage: Overview

1. Automatic transfer and interpretation of detailed personal data from EMR & return of risk reports to PCPs

2. Sharing of accurate info between family members

3. Continuously updated and personalized recommendations based on guidelines and evidence

Easy for patients to collect, maintain, and share their family health history.
Health Heritage: EMR Integration & Family Sharing

• Data pulled from EMR using SQL queries to Clarity database
• Discrete data translated to and from other coding schemes (e.g. SNOMED, ICD-9)
• Pathology reports processed using our Natural Language Processing (NLP) solution (e.g. number/type of colon polyps, specific cancer diagnoses)
• Risk assessment reports are sent back to the patient’s medical record (at patient discretion) as an HL7 ORU message
• Global family tree modeled as a directed acyclic graph using mother and father links; allows for family sharing using “scoping” and “permissions”
Health Heritage: Personalized risk assessment

<table>
<thead>
<tr>
<th>Current Conditions:</th>
<th>Planned:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast Cancer</td>
<td>Lung Cancer</td>
</tr>
<tr>
<td>Colorectal Cancer</td>
<td>Thyroid Cancer</td>
</tr>
<tr>
<td>Melanoma</td>
<td>Cardiovascular Disease</td>
</tr>
<tr>
<td>Ovarian Cancer</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Pancreatic Cancer</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Prostate Cancer</td>
<td>Stroke</td>
</tr>
<tr>
<td>Uterine Cancer</td>
<td>Alzheimer’s/Dementia</td>
</tr>
</tbody>
</table>

Risk engine based on guidelines where available (e.g., NCCN & ACS), extensive literature review, and open source quantitative risk models
Each risk factor (algorithm) is linked to a risk level and evidence-based recommendations:

1. Genetic/Specialty Services
2. Cancer Screening
3. Risk Reduction

### Risk Factors & Analysis

We look at 102 factors in your personal health history and family history that scientists say are predictors of 7 common types of cancer in women. Based on the information you've provided as of March 15, 2016:

**You are at high risk for**

- **Melanoma**
  - because you have a history of melanoma,
  - and you have 1st degree relative with the BRCA1 or BRCA2 gene mutation

**You are at moderate risk for**

- **Colorectal Cancer**
  - because you've had adenomatous polyps in your colon,
  - and you've been diagnosed with inflammatory bowel disease,
  - and you have 1st degree relative with the BRCA1 or BRCA2 gene mutation

**You potentially have increased risk for**

- **Pancreatic Cancer**
  - because you have 1st degree relative with the BRCA1 or BRCA2 gene mutation
- **Ovarian Cancer**
  - because you have 1st degree relative with the BRCA1 or BRCA2 gene mutation
- **Breast Cancer**
  - because you have 1st degree relative with the BRCA1 or BRCA2 gene mutation

**You are at average risk for**

- **Uterine Cancer**
Health Heritage: Current (future) development

- Cloud-native architecture; improved performance and scalability
- Modern responsive web app to enable phone/tablet use
- Use in CancerMoonshot2020 research data collection with over 20,000 participants anticipated ([www.cancermoonshot2020.org](http://www.cancermoonshot2020.org))
- Integration with clinical warehouses and bio-banking initiatives at large integrated health systems & integration with other apps (HL7 v3 Pedigree?)
- *Disease risk coverage beyond cancer to include common cardiovascular, neurologic, and metabolic conditions.*
- Enable consumers to upload data from other sources (e.g., Blue Button/NATE)
- Connecting/sharing with family members via Facebook®