Creating a Precision Healthcare System: Opportunities and Challenges

Session #PM3, February 19, 2017

Thomas D Brown, MD, MBA, Executive Director, Swedish Cancer Institute (SCI)
Speaker Introduction

Thomas D Brown, MD, MBA

Executive Director, Swedish Cancer Institute (SCI)
Co-Chair PSJH Personalized Medicine Program
Co-Chair PSJH Cancer Leadership Council
Seattle, Washington
Disclosures

**Consulting**
GenomiCare, Inc. – Member, Scientific Advisory Board
Jiahui Holding Co., Ltd – Lead Clinical Advisor

**Speaker’s Bureau**
Novartis Pharmaceuticals Corporation

**Stock**
GenomiCare, Inc.
Agenda

• About Providence St. Joseph Health (PSJH)
• PSJH Personalized Medicine Program (PMP) Overview
  – PSJH (SCI) Personalized Medicine Research Program
  – PSJH PMP IT Platforms & Clinical Trials Matching
  – PSJH PMP Initiatives
Learning Objectives

• Summarize the implementation of a successful enterprise-wide precision medicine and research program
• Describe the challenges faced in matching a large population of patients to clinical trials
• Explain how automated clinical trial matching was implemented through an innovative IT solution
The speaker must provide a 45-50 minute PowerPoint presentation (approx. 25-30 slides). Please do not exceed this time limit.

Leave 10-15 minutes at the end for Q&A.
Providence St. Joseph Health Overview

- 50 Hospitals
- 829 Clinics
- 23K Physicians
- 14 Supportive Housing Facilities
- 106K Caregivers
- 1.9m Covered Lives
- 90 Non-Acute Services
- High School, Nursing Schools, and University

Providence Health & Services
- Western Washington, including Swedish Health Services and Pacific Medical Centers

Providence Health & Services
- Eastern Washington/Western Montana, including Kadlec Regional Medical Center

St. Joseph Health
- Northern California (Humboldt, Napa, Sonoma Counties) including St. Joseph Heritage Healthcare

Providence Health & Services
- Southern California (Los Angeles County), including Kaiser Permanente

St. Joseph Health
- Southern California (Orange and San Bernardino Counties) including Hoag Health and St. Joseph Heritage Healthcare

St. Joseph Health
- West Texas/Eastern New Mexico, including Covenant Health and Covenant Medical Group
PSJH Personalized Medicine Program (PMP)  
Program Vision and Goal

- **Vision**: Create an enterprise wide genomics and personalized medicine program to best serve our patients and support our institutes

- **Goal**: Leverage the knowledge of existing programs within PSJH to create a nationally recognized clinical and research genomics program
## PSJH Genomics Focus Groups

**Co-Chairs:** Thomas Brown, MD, MBA & Walter Urba, MD, PhD

<table>
<thead>
<tr>
<th>FOCUS GROUPS</th>
<th>LEADS</th>
<th>PURPOSE/PRIORITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioinformatics</td>
<td>Carlo Bifulco, MD</td>
<td>Genomics data storage/cloud-based bioinformatics analysis pipeline and clinical data integration</td>
</tr>
<tr>
<td></td>
<td>Paul Tittel</td>
<td></td>
</tr>
<tr>
<td>Registry/Repository</td>
<td>Charles Drescher, MD</td>
<td>System wide registry/consent template with networked bio-repositories</td>
</tr>
<tr>
<td></td>
<td>Ora Gordon MD, MS</td>
<td></td>
</tr>
<tr>
<td>Laboratory Specifications</td>
<td>Carlo Bifulco, MD</td>
<td>Alignment and determination of genomics services, platforms, policies and standards</td>
</tr>
<tr>
<td></td>
<td>Anna Berry, MD</td>
<td></td>
</tr>
<tr>
<td>Clinical Applications</td>
<td>Philip Gold, MD</td>
<td>Molecular tumor board, patient engagement center integration into PH&amp;S genomics initiative, and education components</td>
</tr>
<tr>
<td></td>
<td>Karen Appelbaum</td>
<td></td>
</tr>
<tr>
<td>Research</td>
<td>John Pagel, MD, PhD</td>
<td>Registry protocol and resource inventory, governance of data usage</td>
</tr>
<tr>
<td></td>
<td>Rom Leidner, MD</td>
<td></td>
</tr>
<tr>
<td>Business &amp; Logistics</td>
<td>Nancy Frisco</td>
<td>Development of business plan/pro-forma and budget</td>
</tr>
<tr>
<td></td>
<td>Jim Yates</td>
<td></td>
</tr>
</tbody>
</table>
Key Components – PSJH PMP

• Patient Engagement Center
• 300~ Gene Alteration Panel
• IRB Approved Registry Trial
• Implementation of Bioinformatics Platforms (e.g. Syapse)
• Regional Molecular Tumor Boards
• Bio-repository Platform
• De-identified data sharing (OPeN)
Swedish Cancer Institute Personalized Medicine
“Double Meaning”

Clinical practice at the SCI is predicated on a research driven, evidence-based, multi-disciplinary, multi-professional, disease site oriented, patient-centered care model, in the context of Personalized Medicine. Personalized Medicine in this context focuses on two meanings:

1. Caring for the whole patient, to include addressing patient and family socioeconomic, psychological, environmental, and other supportive care needs;

2. Utilizing molecular (gene, protein, epi-genetic) information from the patient or their tumor to address cancer risk, prevention, screening, early and accurate diagnosis, treatment of disease, and survivorship.
SCI (PSJH) Personalized Medicine Program Progress

2014 Mar
PMP Panel 1st Edition
(68 gene panel)

2014 Sep
Personalized Medicine
Research Program Protocol
(IRB approved)

2015 Jan
Molecular Tumor Board
Launch

2015 Nov
PMP IT Platform
(Syapse) Launch

2016 Mar
Innovative Therapeutics
Unit (Early Phase Clinical
Trials Unit) Open

2016 Nov
PMP Panel 2nd Edition
Portland (4Q, 2016)
and Seattle (2Q, 2017)
PSJH PMP Panel – 2nd Edition

- Expansion to 300+ genes (Portland / 4Q, 2016 and Seattle / 2Q, 2017)
  - Published literature on cancer genomics
  - TCGA data for major cancer types
  - Specialized set of genes for hematologic malignancies
  - Treatment and pathway-based strategies

- Mutation types to be covered:
  - Point mutations, small insertions and deletions
  - Copy number variations
  - Common fusions in solid tumors
  - Most of the known fusions in leukemia and lymphoma
SCI PMRP: Eligibility Criteria

Inclusion Criteria

- Patients with active malignancies or selected pre-malignant conditions to include: myelodysplastic syndromes (MDS), actinic keratosis, Barrett’s esophagus, cervical dysplasia, colonic polyps, lung metaplasia, and oral leukoplakia
- 18 years of age, or older
- ECOG performance status of 0 to 2
- A candidate for anti-cancer therapy
- Life expectancy of at least three months
- Measurable or evaluable disease is not required; e.g. patients in the adjuvant setting may be enrolled, if clinically appropriate
SCI PMRP: Eligibility Criteria (cont’d)

• Prior malignancy or multiple current malignancies allowed
• Patients who previously had gene sequencing are allowed
• All patients must be informed of the investigational nature of this study, and must give written informed consent, in accordance with institutional and federal guidelines

Exclusion Criteria

• Patients who are not able to understand and consent for themselves to the PMRP
• Patients who do not have sufficient tissue available for the PMP Panel
SCI PMRP: Recruitment/Enrollment

• **Enrollment:** 877 patients (as of January 9th, 2017); initial focus on solid tumors

• **Locations:** SHS First Hill, Cherry Hill, Edmonds, Ballard, Issaquah; Swedish Neurosciences Institute (SNI). To expand to include Providence Olympia, Portland and Everett

• **Insurance Status:** No restrictions

• **Cost to Participate in PMRP:** None (PMP Panel ordered by provider, and billed based on “medical necessity”)

• **Language:** Consent form in English, Vietnamese, Korean, Japanese, Chinese (Mandarin & Cantonese), Russian and Spanish
SCI PMRP Workflow

**Testing**

Patient receives gene sequencing test (based on medical necessity)

**Enrollment**

Patient signs consent

**Follow-up**

Patient is followed, at least annually, to review disease status and to identify need for clinical interpretation update

**Update**

Provider and patient receive updated reports
PSJH PMP – Informatics Platform

Collect, manage, integrate, visualize, analyze & share

Clinical Interpretation (e.g. annotation, therapeutic options, literatures)
Molecular Pathology
External Labs (e.g. genetic & genomic testing)
Genomic Data & Tools (e.g. TCGA - Human Genome Project)

State/ National Registries
Disease Site Registries (Research)
Providence / Swedish Enterprise Data Warehouse

Clinical Interpretation

Clinical Trials.Gov

Electronic Medical Record

Providence & Swedish Cancer Registries

Existing Platforms
2017 – Platforms
Existing Interface
2017 – Interface

Providence Research and Clinical Trials Website

Clinical & Genomic Medicine Platform
Synoptic Pathology
Clinical Trials Management System

Providence / Swedish Enterprise Data Warehouse
PSJH Syapse: Clinical History
**PSJH Syapse: Lab Results**

### Clinical History

**DATE RANGE:** 2014-12-28 TO 2015-03-28

**Select Clinical Data to View**

### Lab Results

**No data available for HEPATIC FUNCTION PANEL.**

- **How to read the results:**
  - Lab result
  - Result is outside the reference range
  - Reference range defined by the lab

#### CBC WITH DIFF (ABS-%)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MAX</th>
<th>MIN</th>
<th>RANGE</th>
<th>RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASOPHILS</td>
<td>0.0</td>
<td>0.0</td>
<td>-0.1</td>
<td>-0.1</td>
</tr>
<tr>
<td>EOSINOPHILS</td>
<td>0.3</td>
<td>0.0</td>
<td>-0.5</td>
<td>-0.5</td>
</tr>
<tr>
<td>HEMATOCRIT</td>
<td>33.1</td>
<td>21.0</td>
<td>-15.0</td>
<td>-15.0</td>
</tr>
<tr>
<td>HGB</td>
<td>12.0</td>
<td>7.0</td>
<td>11.6</td>
<td></td>
</tr>
</tbody>
</table>

**Select Markers To View**
PSJH Syapse: PMP Panel Results
**PSJH Syapse: PMP Panel Results (Cont’d)**

<table>
<thead>
<tr>
<th>BRAF</th>
<th>FDA Approved for Patient’s Indication?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Therapy</td>
<td>Trametinib</td>
<td>Effect</td>
</tr>
<tr>
<td>FDA Approved?</td>
<td>Yes</td>
<td>FDA Approved for Patient’s Indication?</td>
</tr>
<tr>
<td>BRAF</td>
<td>Therapy</td>
<td>sorafenib</td>
</tr>
<tr>
<td>FDA Approved?</td>
<td>Yes</td>
<td>FDA Approved for Patient’s Indication?</td>
</tr>
</tbody>
</table>

### Potential Clinical Trials

<table>
<thead>
<tr>
<th>FBXW7</th>
<th>Dose Escalation Study of MLN0128 in Subjects With Advanced Malignancies</th>
<th>FBXW7</th>
<th>Phase I Dose Escalation Study of VS-5584 in Subjects With Advanced Non-Hematologic Malignancies or Lymphoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBXW7</td>
<td>A Phase 1 Study of MM-141 in Patients With Advanced Solid Tumors</td>
<td>FBXW7</td>
<td>Clinical Study Of PI3KmTOR Inhibitors In Combination With An Oral MEK Inhibitor Or Irinotecan In Patients With Advanced Cancer</td>
</tr>
<tr>
<td>FBXW7</td>
<td>Phase 1b Study of MLN0128 in Combination With MLN1177 in Adult Patients With Advanced Nonhematologic Malignancies</td>
<td>FBXW7</td>
<td>A Study Of FF-05212584 Plus FOLFOXIRI Versus Bevacizumab Plus FOLFOXIRI In Metastatic Colorectal Cancer</td>
</tr>
<tr>
<td>FBXW7</td>
<td>Phase 1 Dose Escalation Study of ARQ 092 in Adult Subjects With Advanced Solid Tumors and Recurrent Malignant Lymphoma</td>
<td>FBXW7</td>
<td>Tivantinib and Temsirolimus in Treating Patients With Solid Tumors That Is Metastatic or Cannot be Removed by Surgery</td>
</tr>
<tr>
<td>BRAF</td>
<td>A Study to Investigate the Safety, Pharmacokinetics, Pharmacodynamics, and Anti-Cancer Activity of Trametinib in Combination With Paclitaxel in Subjects With Solid Tumors</td>
<td>BRAF</td>
<td>A Phase 1b Study of MPDL3280A (an Engineered Anti-PDL1 Antibody) in Combination With Colcemid In Patients With Locally Advanced or Metastatic Solid Tumors</td>
</tr>
<tr>
<td>BRAF</td>
<td>Regorafenib+ FOLFOXIRI Versus Placebo+FOLFOXIRI as 2nd Line Tx in Metastatic Colorectal Cancer</td>
<td>BRAF</td>
<td>Pharmacokinetics and Safety of Regorafenib (BAY73-4506) in Cancer Subjects With Severe Renal Impairment</td>
</tr>
</tbody>
</table>
PSJH Syapse: Similar Patients
Clinical Trials – Challenges in the Era of Personalized Medicine

Population Level
- Assess clinical trial feasibility in a given population
- Develop agile research infrastructure to accommodate evolving clinical trials network/design
- Screen and track status of every patient for clinical trial eligibility
- Provide access to all eligible patients in diverse populations

Patient Level
- Identify, integrate and prioritize clinical trial options available within the system, regionally and nationally, at point of care
- Screen patients against numerous and complex eligibility criteria
- Support patient education and engagement
- Keep treatment options updated throughout continuum of care
PSJH Syapse: Clinical Trials Guidance

Clinical Trial Matches

A Dose-Escalation Study to Determine the Maximum Tolerated Dose, Safety, and Preliminary Antitumor Activity of Oral ACY-341 Alone and in Combination With Pomalidomide and Low Dose Dexamethasone in Relapsed or Relapsed and Refractory Multiple Myeloma

Clinical Trial Recommendations

1 trial recommended

Clinical Trial Name: Phase I Study to Assess the Safety, Tolerability and Pharmacokinetics of CUDC-907 in Patients With Lymphoma or Multiple Myeloma

Syapse

Clinical trials rules engine

NGS reports
Clinical Trials Matching
Dynamic matching, with results at point-of-care

Syapse software automates key parts of workflow:
1. Aggregation of structured clinical & molecular data
2. Structured trial eligibility criteria for high-value data elements
3. Trials matching rules engine – runs nightly to identify provisional matches across all patients & all trials
4. Clinical trials dashboard for research coordinators & care team
5. Clinical trial eligibility assessment form in Syapse – pre-populated with patient data
6. Clinical trials feasibility assessment support – advanced query

Current
Future

Patient
Age + Gender

- Diagnosis Codes
  - ICD-9 / ICD-10/PMRP
- Performance Status
  - ECOG score
- Medications
- Surgery
- Radiation Therapy
- Toxicity

- Cancer
  - Site + Stage + Histopathology
  - PMRP Staging
  - Epic Staging
  - Cancer Registry
  - Breast Registry
- Lab Results
- Hormone Receptors
  - ER, PR, HER2
- Gene Alternations
  - 68-gene NGS

Clinical trials rules engine
- Study Feasibility
- Screening
Clinical Trials Matching
Research coordinator dashboard listing provisional trial matches

Show list of patients who have matches and an encounter within next 7 days

Matched trial
Clinical Trials Matching

Eligibility assessment form with pre-populated clinical data

**Structured eligibility criteria**

- **LENALIDOMIDE 25 MG ORAL CAP**
  - *Lenalidomide*
  - 2016-10-02T21:19:00+00:00
  - Swedish Epic

**Automatically populated with relevant patient data from EHR & other sources**

- **LENALIDOMIDE 25 MG ORAL CAP**
  - *Lenalidomide*
  - 02T21:19:00+00:00
Clinical Trials Matching

Interface for defining structured criteria for automated pre-screening

Criterion description (displayed to providers in trial eligibility form) *

ALK positive

Select one or more datasets to be displayed. For example disease status, treatment, etc.

Select patient data to display in trial eligibility form:

- Relevant Genes

Filter data to display

In order to show only relevant gene, select the gene(s) to show on this form:

Gene *

ALK

Build pre-screening rule

Match(es) All Any of the following

Not Medication Information that matches All Any of the following

Not Generic Drug = pembrolizumab

Not Generic Drug = crizotinib

Structured eligibility criteria
Clinical Trials Matching

Early experiences at Swedish Cancer Institute

Swedish Cancer Institute Clinical Trials

• 250 active/enrolling trials

101 active/enrolling therapeutic cancer trials are in Syapse

• 35 trials in Syapse have genomic/biomarker (e.g. hormone receptor) eligibility rules

• 45 trials “published” to active patient matching. 56 trials are not used for clinical trials matching (e.g. study closed, study not yet opened, study being configured/tested and used for clinical trials feasibility assessment)

• 40% (~9,000) of SCI patients seen in 2016 have been provisionally matched to at least one trial in Syapse

As of Jan 5th, 2017
SCI Molecular Tumor Board

- **Co-chairs:** Anna Berry, MD; John Pagel, MD, PhD; and Charles Drescher, MD

- **Purpose:** multidisciplinary case review focused on clinically relevant gene alterations and associated molecular pathways, with aim of facilitating patient management decisions

- **Conference Structure:**
  - Average 3-4 cases including follow-up cases
  - Cases submitted by physicians and selected by Dr. Berry
  - Special sessions (e.g. implications for germline genetic testing)
Molecular Tumor Board Case – 4/6/15

History:

• 60 yo man, presented in May of 2014 with hemoptysis. He had intermittent fevers and was treated with antibiotics with a 5 kg weight loss. Smoking history of 10 pack-years, but quit 10 years ago. CT scan showed an 8.8 x 9.6 cm mass in the right upper lobe (RUL) of the lung, occluding the RUL bronchus and invading the adjacent mediastinum with enlarged regional lymph nodes.

• The tumor was resected in June, 2014, along with a separate 1.2 cm nodule in the RUL adjacent to the main mass. The tumor was staged as pT3, pN0, M0 (IIB).

• Chemotherapy was offered and declined. He had an extensive local recurrence in the chest and eventually did start chemotherapy in November, 2014. His disease has remained stable since, and there is no evidence of distant metastases.

• Prior Treatment: Chemotherapy (Cisplatin + Paclitaxel, and Cisplatin + Gemcitabine)
Molecular Tumor Board Case – 4/6/15

Tissue Tested: Pleural metastasis and primary tumor

- Needle biopsy of his RUL mass showed a poorly differentiated squamous cell carcinoma.
Molecular Tumor Board Case – 4/6/15

Aberrations:
• PIK3CA-E545K (detected only in primary tumor)
• PTEN-D162fs*6

Source: Nikiforov Y & Nikiforova MN, Nature Reviews Endocrinology 2011
Significantly mutated genes in lung SQCC

Molecular Tumor Board Case – 4/6/15

• Possible Therapies:
  • Everolimus
  • Temsirolimus

• Possible Clinical Trials:
  • NCT01226316: Safety, Tolerability & Potential Anti-cancer Activity of Increasing Doses of AZD5363 in Different Treatment Schedules (AstraZeneca, OR, CA, and 8 other US locations)
  • NCT01347866: Clinical Study Of PI3K/mTOR Inhibitors in Combination with an Oral MEK Inhibitor or Irinotecan, in Patients with Advanced Cancer (Pfizer, CA, CO, SC)
  • NCT02260661: Phase I, Dose Study to Look at the Safety and Pharmacokinetics of AZD8835 in Patients with Advanced Solid Tumors (AstraZeneca, CO, TN)
  • NCT01827348: NCI-MPACT: Molecular Profiling-Based Assignment of Cancer Therapy for Patients With Advanced Solid Tumors (NCI, MD)
## FDA-Approved Drugs with a Companion Diagnostic

<table>
<thead>
<tr>
<th>Drug</th>
<th>Disease</th>
<th>DNA mutation</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imatinib, Dasatinib, Nilotinib, Bosutinib</td>
<td>Chronic myelogenous leukemia</td>
<td>BCR-ABL1 fusion</td>
<td>Indication for therapy</td>
</tr>
<tr>
<td>Ponatinib</td>
<td>Chronic myelogenous leukemia</td>
<td>BCR-ABL1 fusion, T315I resistance mutation</td>
<td>Only indicated for T315I mutations</td>
</tr>
<tr>
<td>Erlotinib, Afatinib, Gefitinib</td>
<td>Lung adenocarcinoma</td>
<td>EGFR, Exon 19 deletions, L858R</td>
<td>Indication for therapy</td>
</tr>
<tr>
<td>Vemurafenib, Dabrafenib</td>
<td>Melanoma</td>
<td>BRAF V600E</td>
<td>Indication for therapy</td>
</tr>
<tr>
<td>Tramatenib</td>
<td>Melanoma</td>
<td>BRAF V600E/K</td>
<td>Indication for therapy</td>
</tr>
<tr>
<td>Crizotinib</td>
<td>Lung cancer</td>
<td>ALK gene fusions</td>
<td>Indication for therapy</td>
</tr>
<tr>
<td>Cetuximab, Panitumumab</td>
<td>Colon cancer</td>
<td>KRAS codon 12, 13</td>
<td>Contraindication to therapy</td>
</tr>
<tr>
<td>Olaparib</td>
<td>Ovarian cancer</td>
<td>BRCA1 and BRCA2 mutations</td>
<td>Indication for therapy</td>
</tr>
<tr>
<td>Osimertinib</td>
<td>Non-small cell lung cancer</td>
<td>EGFR mutation, T790M</td>
<td>Indication for therapy</td>
</tr>
<tr>
<td>Venetoclax</td>
<td>Chronic Lymphocytic leukemia</td>
<td>Deletion 17p-</td>
<td>Indication for therapy</td>
</tr>
</tbody>
</table>
PSJH Personalized medicine Program (PMP)
Program Vision and Goal

Phase I – PSJH Personalized Medicine Program (PMP) at Large Regional Cancer Centers

Phase II – PSJH PMP expansion across the enterprise

Phase III – Whole Exome and Transcriptome Sequencing, Proteomics, Micro-biomics, and Immune profiling
Data sharing through Oncology Precision Network (OPeN)

- **Founding Members**: Intermountain Healthcare, Providence St. Joseph Health, and Stanford Cancer Center
- **Goal**: to create a big data resource for clinical care and research using de-identified data
- **Data shared**: genetic variants, tumor type/site, tumor stage, histology, tumor biomarkers, recommended and actual drug treatment, clinical outcomes, ethnicity/race, age and gender of the patient
TP53 gain of function (GOF) mutations identified by tumor sequencing performed in the context of a community based Personalized Medicine Cancer Program

C. W. Drescher¹, A. B. Berry¹, B. J. Beatty¹, D. Xu², X. Liu¹, M. Zhang³, K. Keith², J. D. Scanlan³, J. M. Pagel¹, P. J. Gold¹, D. Markowitz¹, T. L. Benkers⁴, C. Bonham¹, M. Tameishi¹, T. D. Brown¹. ¹Swedish Cancer Institute, Swedish Cancer Institute. ²CellNetix Pathology and Laboratories, Molecular Pathology. ³Swedish Medical Center, The Swedish Center for Research and Innovation. ⁴Swedish Neuroscience Institute, Ben & Catherine Ivy Center. EORTC-NCI-AACR Molecular Targets and Cancer Therapeutics Symposium, Nov, 2016.

• Overall 47 pts (10%) of 468 pts were identified as having GOF mutations.
• The frequency of GOF mutations varied by disease site ($X^2 = 37.8$, $p<0.001$); these results were driven largely by the absence of GOF mutations in patients with breast cancer. GOF mutations in decreasing frequency were: R273C, H or L (n= 18), R175H (n=15), R248W or Q (n=13) and P151S (n=1).
• Three of the four R273L occurred in patients with NSCLC, and accounted for 60% of GOF mutations in NSCLC pts.

Table 1: Summary of TP53 sequence results

<table>
<thead>
<tr>
<th></th>
<th>Breast</th>
<th>CNS</th>
<th>Colorectal (CR)</th>
<th>Non-CR GI</th>
<th>NSCLC</th>
<th>Ovary</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>Mt GOF</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>16</td>
<td>9</td>
<td>11.5</td>
<td>10</td>
</tr>
<tr>
<td>Mt non-GOF</td>
<td>10</td>
<td>16.4</td>
<td>16</td>
<td>21.3</td>
<td>23</td>
<td>29.5</td>
<td>18</td>
</tr>
<tr>
<td>VUS</td>
<td>2</td>
<td>3.3</td>
<td>8</td>
<td>10.7</td>
<td>2</td>
<td>3.6</td>
<td>3</td>
</tr>
<tr>
<td>Wild-type</td>
<td>49</td>
<td>80.3</td>
<td>39</td>
<td>52</td>
<td>44</td>
<td>56.4</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
<td>100</td>
<td>75</td>
<td>100</td>
<td>78</td>
<td>100</td>
<td>63</td>
</tr>
</tbody>
</table>
Questions

Thomas D Brown, MD, MBA
Executive Director, Swedish Cancer Institute (SCI)
Co-Chair PSJH Personalized Medicine Program
Co-Chair PSJH Cancer Leadership Council
Seattle, Washington

Email: Thomas.Brown@Swedish.org

**Please complete online session evaluation**