Reinventing Oncology through AI

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Founder and Chairman

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Precision Oncology Network

- Network of world-class physicians and researchers
- ~4,000 patients who have benefitted from ASK virtual tumor boards
- Multiple peer reviewed publications
- American Cancer Society collaborator

**Software and Services**

- **Share Knowledge** across virtual tumor boards
- **Facilitate Access** to recommended therapies
- Capture resulting **real-world data**
- **Coordinate treatment** across patients to optimize outcomes and learning
Cancer Commons and xCures:

A *perpetual trial* that continuously learns from all patients, all physicians, all therapies, all the time.

An AI-based *precision oncology platform* that coordinates treatment plans to globally optimize individual outcomes and collective knowledge.

Creating value

- Faster, cheaper development of drugs and tests
- Payers pay only for what works
- Patients get the best outcomes
For Advanced Cancer Patients, Getting the Best Care Is a Nightmare

No one knows the optimal way to treat any cancer, many patients can’t get or pay for the drugs they need and treatment outcomes vary widely.

Each year thousands die unnecessarily.
Drug Development Is About to Hit the Wall

**CLINICAL TRIALS ARE UNSUSTAINABLE**
- Too slow (5-10 years)
- Too expensive ($100M+)
- Outcomes vary widely

**TOO MANY DRUGS, TOO FEW PATIENTS**
- ~3500 open IO trials in the US
- Requiring ~600,000 patients
- Only ~50,000 patients / year enroll in trials

The problem is getting exponentially worse with the explosion of molecular cancer subtypes and new oncology drugs.
Regulators Agree That Change Is Needed

“We must bridge clinical research and health care or the entire enterprise is going to fall down.” – Janet Woodcock, Director, CDER. FDA

- Master protocols
- Adaptive designs
- Seamless trials
- Expanded access
- Real-world evidence (RWE)

Helpful but not enough to solve the existential problem: too many options, too few patients

We need a paradigm shift to integrate clinical research and care
From Approving Drugs to Curing Patients

**OLD WAY**
Trials finding best patients for a given drug

**NEW WAY**
Leveraging knowledge and AI to find the best drug regimens for each patient

xCures globally optimizes the allocation of patients and drugs to ensure superior outcomes and prioritize development of the most promising therapies.
Slashing the Time and Cost of Drug Development

**TRADITIONAL TRIALS**
- Patients: 100%
- Clinical trial: 95%
- No or inferior care: 5%
- Inclusion/exclusion criteria
- Randomized control
- Geographic disparity

5-10 years, 200 patients @ $50,000

Each site / phase starts anew
New sites take months
Trials compete selfishly for patients

**XCURES TRIALS**
- Patients: 100%
- No inclusion/exclusion
- No randomized control
- All geographies

1 year, 20 patients @ $2,000

Always on and siteless
Costs amortized across all drugs
Globally optimize patient utilization in trials
Creating Value Through a Master Platform and AI

A Common Platform Across Clinical Trials and N-of-1 Studies

AI Dynamically Allocates Patients and Drugs to Optimize Outcomes

Insights Shared Across Ecosystem
Cancer Commons

4000 patients, 40+ countries

Patient and Physician → Cancer Network Partner → Case Referral → Virtual Tumor Board → Ranked Options for Care → Make Decision → Capture Outcome
Cancer Commons + xCures

Globally coordinate treatment plans across patients

Virtual Tumor Board
Ranked Options for Care
Make Decision
Capture Outcome

Initial Options

Knowledge Base
(options, rationales and outcomes)
xCures Platform: Options, Access and Outcomes

LEARNING FROM ALL PATIENTS. ALL PHYSICIANS. ALL THERAPIES. ALL THE TIME.

SUPPORTING VIRTUAL TUMOR BOARDS
- Knowledge sharing
- Decision support
- Treatment planning

SERVICING PATIENTS
- Trial enrollment
- Expanded access
- Reimbursement for approved drugs

TRACKING REAL WORLD EVIDENCE
- Master protocol
- Data registries
Options – Using Experts and AI to Optimize Care

Knowledge Sharing
NLP to capture treatment options, recommendations, and rationales from literature, conferences, social media, and real-world evidence.

Decision Support
Virtual Tumor Boards develop treatment options for each patient, balancing personal insights against outcomes data and new options injected by researchers and industry.

Treatment Planning
Evaluating patient’s treatment longitudinally with multiple drug regimens, to maximize shots on goal.

Source: stanford.edu
Access – Getting Right Drugs to Patients

xCures SERVICES

• Trial matching and enrollment (ethical)
• Manage expanded access programs and trials
• Pay-for-performance program
• Clearinghouse for EA and off-label drugs

BENEFITS

• Patients get access to the latest drugs
• xCures gets hot drugs on our platform for use by patients in Virtual Trials
• Companies get real world data to accelerate approvals, label extensions, reimbursements
• Physicians get administrative support
Outcomes – Generating Real World Evidence

**XCELSIOR Study**

- IRB-approved Master Protocol
- Always-on: All patients and all treatments
- Add new sites, PIs, and drugs in days through amendments, sub-PIs, and subprotocols
- Patient-centric design: minimal inclusion / exclusion criteria; no randomized controls
- Level 1: Observational registry captures longitudinal, regulatory grade, treatment and outcomes data
- Level 2: Virtual Tumor boards and Virtual Trials seek to optimize individual outcomes and collective learning
- Innovative statistics for efficient signal generation from small data sets

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**REDCAP CLOUD**

- 21 CFR Part 11 Validated, HIPAA & FISMA compliant, and WHODrug and MedDRA certified EDC system
- All access and activity in the system is tracked
- Audit trail shows who made a change, the date and time, and the old and new values
- Standardized data reporting forms support precision oncology studies for most solid tumors
- Reporting forms can be quickly customized to capture study-specific fields
Coordinate treatment plans across patients to maximize information gain and collective learning:

- Rapidly replicate successes and quash failures
- Optimally allocate patients so therapies succeed or fail fast, using the fewest patients
- Run ‘Pop-up’ experiments to resolve equipoise sets, where it’s unclear which option is best
- Efficiently search the vast space of plausible combination therapies
- Prospectively plan experiments to get the data you need, not just the observational data in EHRs
## Pilot: Brain Cancer

### UNMET NEEDS

<table>
<thead>
<tr>
<th>Disease</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glioblastoma Multiforme (GBM)</td>
<td>20,000 / year, prognosis 1 year</td>
</tr>
<tr>
<td>Diffuse Intrinsic Pontine Glioma (DIPG)</td>
<td>250 kids / year, prognosis: 9 months</td>
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### xCures SOLUTION

<table>
<thead>
<tr>
<th>Solution</th>
<th>Details</th>
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<tbody>
<tr>
<td>Expanded access program</td>
<td>makes promising drugs available to patients</td>
</tr>
<tr>
<td>Perpetual trial</td>
<td>continually refines treatment regimens and cohorts</td>
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### IMPACT

<table>
<thead>
<tr>
<th>Impact</th>
<th>Details</th>
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<tbody>
<tr>
<td>Better outcomes for GBM and DIPG patients</td>
<td></td>
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<tr>
<td>Regulatory-grade real-world data for pharma</td>
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<tr>
<td>Royalty payments from future sales</td>
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# Pilot: Pancreatic Cancer

## UNMET NEED

<table>
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<tr>
<th>Stage 4 Pancreatic Cancer</th>
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<tbody>
<tr>
<td>40,000 adults / year, 35,000 die</td>
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<tr>
<td>prognosis: 14 months</td>
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## xCures SOLUTION

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<tr>
<th>Use Perpetual Trial to explore novel regimens (e.g., Mekinist + Chloroquine)</th>
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<tr>
<td>Pay for performance program covers drugs used off-label...when they work.</td>
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## IMPACT

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<th>Giving advanced stage patients new options</th>
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<tr>
<td>Generating real-world evidence for FDA filings</td>
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<tr>
<td>Drug salvage and repurposing</td>
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<tr>
<td>Potential label expansion</td>
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> ..If we’d been using your platform, we’d already know the answer. We’ll use it for the next combo in our pipeline

– Medical oncologist with exciting new combo therapy
Value for All Stakeholders

PATIENTS
- Consults with VTB experts; Access to top drugs; Superior Outcomes

PHARMA
- Faster, cheaper trials $\rightarrow$ approvals, label expansions, compendia listings.
- Early signals. Salvage drugs abandoned for business reasons.

PROVIDERS

RESEARCHERS
- Clinical data. Outcomes data. Rapid Investigator Initiated Studies.

PAYERS
- Pay only when drugs work. Trusted data for claims adjudication.
5 Year-Goal: A Network of Networks

- **Advocacy Groups**
- **Bio-Pharma**
- **Partner Networks**
- **Technology Partners**
- **Professional Societies**
- **Provider Networks**
- **Government**

**Organizations:**
- MUSELLA FOUNDATION
- PANCREATIC CANCER ACTION NETWORK
- AAGR
- ASCO
- AMA
- AACR
- GBM AGILE
- CHILDREN'S ONCOLOGY GROUP
- CANCERFREEDOM: Eliminate Cancer Initiative
- CANCER RESEARCH INSTITUTE
- AMERICAN CANCER SOCIETY
- VA HEALTHCARE
- KAISER PERMANENTE
- FDA
- NATIONAL CANCER INSTITUTE
- Deloitte
- citizen
- Cellworks
- Guardant
- NOVARTIS
- Oncoceutics
- IOVIA
- VARIAN medical systems
- REDCAP CLOUD
- MASSIVE BIO

**Cooperative Groups:**
- Pacific Pediatric Neuro-Oncology Consortium

**Cancer Foundations:**
- Cancer Commons

**Partner Networks:**
- CancerCommons

**Additional Resources:**
- MUSELLA FOUNDATION
- PANCREATIC CANCER ACTION NETWORK
- AAGR
- ASCO
- AMA
- AACR
- GBM AGILE
- CHILDREN'S ONCOLOGY GROUP
- CANCERFREEDOM: Eliminate Cancer Initiative
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- Cancer Commons
The Timing Is Perfect

- Remarkable Convergence of Events
  - Cheap “omics” and other diagnostic technologies enabling precision medicine
  - 100s of exciting new oncology drugs and immunotherapies with strong scientific rationales
  - 1000s of non-cancer drugs that could be repurposed
  - AI, Machine Learning, and data analytics coming of age
  - Clinical trial innovations: e.g., master protocols, RWE
  - Favorable regulatory environment
Seize the Moment:
Join the Commons

Huge unmet need for patients
Existential crisis for pharma
Paradigm shift to patient-centric clinical trials
Transformative clinical oncology network/platform
Powered by AI, ML and Collective Intelligence

Yes, It’s Personal
This could save your life or the life of your spouse or child
JOIN THE COMMONS

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