Ohio Opioid Abuse, Prevention and Treatment Technology Initiative

Proposal Evaluations

Submitted: 07 DEC 2017

Submitted To:

David Goodman
Director, Ohio Development Services Agency
Chair, Ohio Third Frontier Commission
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Executive Summary

The Ohio Opioid Abuse Prevention and Treatment Technology Initiative ("Program") is intended to accelerate the development and commercialization of promising new products (or adaptations or modifications of existing products) in categories of medical devices, diagnostics, pharmaceuticals, and health technology to meaningfully address one or more issues associated with the drug crisis driven by use, misuse, abuse and addictive potential of opioids. Specifically, projects must contribute to near term tangible solutions associated with addiction prevention, treatment and overdose intervention. Technology and products that enable safe and effective treatment of acute and chronic pain without the use of opioids are encouraged.

Projects advancing technologies that have already achieved technical proof of concept and for which there is evidence of interest by a potential end-user are the focus of the Program. Proposals to support products that are already in the market are eligible where the objective of the project is to adapt or modify those products to enable reduction of abuse, addictive potential and morbidity and mortality associated with opioid use. This includes technologies that address overdose prevention, treatment and recovery.

Since the Program is focused on near term commercialization, basic research projects are not eligible for funding. This initiative is focused on innovative technologies and products and not for the direct delivery of social or clinical point of care services.

Due to the vast complexity of the Opioid Crisis, no single technology will resolve it. However, there are some exciting products presented in this report which will, over time, begin to reduce the effects of the epidemic.

The Ohio Third Frontier’s call for near-term and impactful solutions to the opioid crisis prompted 29 organizations to submit proposals. The technologies proposed are expected collectively to provide the desired impact by reducing overdoses, helping addicts in crisis find treatment and support, and reducing the need for opioids.

Quantum Commerce was selected as the independent third-party evaluator for the Program. The Quantum Commerce team, which included a pain specialist physician, a recovering addict, a physician who specializes in drug discovery, a PhD with medical device experience, a pharmacist who works in a large retail pharmacy and three business reviewers, that are well experienced in OTF proposal evaluations, reviewed all applications in detail.

Of the 29 requests for funding two were removed from further consideration during a ‘quick down-select’ process (see process section of appendix). The remaining 27 proposals were all given an in-depth review with 16 of those advancing to the interview stage. From those, seven proposals are recommended for funding. The total recommended amount is $9.99MM, from the $12MM available, and they are listed in rank order below.
Prioritization of technologies presented several challenges, given the unique nature of the opioid crisis. The Review Team considered and weighed a number of criteria but prioritized 1) potential impact of the technology on the opioid crisis in Ohio, and 2) the potential time to market and/or time to scale the solution to realize impacts on the crisis.

Other relevant and important factors were considered: 1) technical probability of success, 2) project dependency on other resources or factors outside the scope of the requested funds, 3) novelty of proposed approach as pertains to opioids, 4) the amount of funding requested weighed against the potential impact on the opioid crisis, and 5) projected sustainability of the business model, as many approaches require unproven revenue models which are often highly reliant on variable grant funding.

Last, the Review Team attempted to ensure a diverse set of approaches among the recommended projects. For example, most pharmaceutical or medical device projects reviewed generally had strong proof-of-concept data and a clear business model to leverage. These could not be equally weighted against potentially impactful data- or communications-based tools, which may be more reliant on grant funding, require repurposing from other uses, or need to create a market and associated revenue streams. Therefore, the Review Team not only weighed applications against the entire pool, but also considered technologies against ‘like’ technologies to ensure a balanced set of recommended solutions.

The Review Team believes that all technologies and products recommended for funding in this report will have a meaningful impact on the opioid crisis.

The Review Team seeks support from the Third Frontier Commission to approve the recommended technologies and looks forward to a robust discussion on December 7th.
### SUMMARY OF RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Proposal/LOI #</th>
<th>Company Name</th>
<th>Type</th>
<th>Request</th>
<th>Recommended</th>
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<td>Innovative Medical Equipment, LLC</td>
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## Proposal - Summary Matrix

### Proposals – Recommended in Rank Order

<table>
<thead>
<tr>
<th>Proposal/LOI #</th>
<th>Company Name</th>
<th>Project Title</th>
<th>Recommend Funds $MM</th>
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<tbody>
<tr>
<td>TECG201180006</td>
<td>Elysium Therapeutics, Inc.</td>
<td>Novel Opioid Analgesics That Prevent Oral Abuse and Lethal Oral Overdoses</td>
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<tr>
<td>TECG201180018</td>
<td>Innovative Medical Equipment, LLC (&quot;IME&quot;)</td>
<td>ThermaZone Thermal Therapy for the Reduction of Opioid Usage</td>
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<td>TECG201180020</td>
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<td>TECG201180035</td>
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<td>Predictive Analytics for the Early Identification of Opioid Addiction, Abuse and Overdose</td>
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<td>TECG201180005</td>
<td>Sober First LLC (dba Ascent)</td>
<td>The Ascent Solution</td>
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<tr>
<td>TECG201180013</td>
<td>Sollis Therapeutics</td>
<td>A long-acting, non-opioid, targeted delivery analgesic for severe sciatica pain.</td>
<td>$2.00</td>
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<tr>
<td>TECG201180022</td>
<td>The University of Akron</td>
<td>Post Operative Pain Management using Therapeutic Meshes</td>
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### Proposals – Not Recommended – Received Interviews

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<th>Project Title</th>
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<tr>
<td>TECG201180010</td>
<td>Neurons Medical, Inc.</td>
<td>Altius® System Commercialization: Nerve Block Therapy to Fight the Ohio Opioid Crisis</td>
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<tr>
<td>TECG201180003</td>
<td>Atalantos Biotechnology, LLC</td>
<td>Aphesin</td>
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<tr>
<td>TECG201180027</td>
<td>Care Coordination Systems LLC</td>
<td>Opioid Pathways Care Coordination Technology Development Project</td>
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<tr>
<td>TECG201180024</td>
<td>SPR Therapeutics</td>
<td>Commercialization of the SPRINT System, an innovative medical device alternative to opioids for the treatment of chronic back pain</td>
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<tr>
<td>TECG201180033</td>
<td>Cincinnati Children’s Hospital Medical Center</td>
<td>Prediction and prevention of opioid tolerance and respiratory depression, using pharmacogenomics based risk stratification and individualized opioid dosing, in adolescents after major surgery</td>
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<td>TECG201180028</td>
<td>Wright State University</td>
<td>REal Time Assessment of Dialogue in Motivational Interviewing (ReadMi)</td>
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<td>TECG201800007</td>
<td>Mu Therapeutics</td>
<td>Development of Neonatal Abstinence Syndrome Therapy</td>
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<tr>
<td>TECG20180012</td>
<td>Think Scientific Innovations, LLC</td>
<td>PRELAPSE: A multi-faced intelligent alerting system to prevent relapse</td>
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<tr>
<td>TECG20180014</td>
<td>iMed MD LLC</td>
<td>Platform for Managing and Monitoring Opiate Adherence to Prevent Addiction</td>
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### Proposals — Not Recommended – Did Not Receive Interview

<table>
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<td>Butterfly Protocol</td>
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<td>TECG20180008</td>
<td>NeuroTherapia, Inc.</td>
<td>NTRX-07, a novel, non-opioid therapy for prevention of chronic neuropathic pain</td>
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<tr>
<td>TECG20180009</td>
<td>IVA Biolabs</td>
<td>Real-time Wearable Sensor to Detect Opioid Overdose and Misuse</td>
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<td>TECG20180015</td>
<td>ChromoCare Holdings, LLC</td>
<td>ChromALERT™ / OOAPTT</td>
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<td>TECG20180016</td>
<td>Rx Directory Online LLC</td>
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<td>TECG20180017</td>
<td>iRxReminder LLC</td>
<td>Platform for Managing and Monitoring Opiate Adherence to Prevent Addiction</td>
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<td>Hope Research Institute</td>
<td>Comprehensive Opioid Prevention, Treatment and Technology</td>
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<td>TECG20180030</td>
<td>The Cleveland Clinic Foundation</td>
<td>Alternative Mechanisms to Control Opioid Adherence and Usage</td>
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<tr>
<td>TECG20180032</td>
<td>Ascend Innovations, Inc</td>
<td>Non-Drug Pain Management Solutions</td>
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<tr>
<td>TECG20180034</td>
<td>Cleveland Clinic</td>
<td>Implantable Temporary Nerve Conduction Blocking System</td>
</tr>
<tr>
<td>TECG20180042</td>
<td>Plitzie LLC</td>
<td>Analytics &amp; Informatics Training: Public Health &amp; First Responders Partnership</td>
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### Proposals Not Recommended – Removed from Consideration at Initial Screening

<table>
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<th>Proposal/LOI #</th>
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<th>Project Title</th>
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<td>TECG20180023</td>
<td>Med-Compliance IQ</td>
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<tr>
<td>TECG20180043</td>
<td>The Health Collaborative</td>
<td>Leveraging digital communication and monitoring</td>
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</tbody>
</table>
**Definition of Columns:**

Proposal # – A unique OTF number for each proposal

Lead Applicant – The Ohio company that is requesting funds

**Impact:**

**Impact:** Is the proposal aligned with the intent of the program? How well do the objectives of the grant align with the problems of the opioid crisis?

**Solution Importance:** What is the relative importance of the problem being solved to the opioid crisis?

**Solution Uniqueness:** How unique is the solution to solving the opioid crisis?

**Market Pull:** What is the end user interest and Impact of the proposed solution?

**Time to Market:** How long until the proposed technology will be available to the market relative to the near-term goal of the program (3-5 years or less)?

**Technical Readiness:**

**Technical Maturity:** Does the technology meet the requirements of the Program (IDE, IND, MVP)? Has the technology progressed beyond the conceptual stage?

**Scientific Soundness:** How sound is the science of the proposal?

**IP:** Degree to which the Lead Applicant has a protected Intellectual Property position with respect to the proposed technology (patents, trade secrets, copyrights, etc.)

**Commercial Readiness:**

**Existing Investment:** The amount and appropriateness of the financial resources that have already been applied to advance the technology to the current level of development.

**Team:** Does the Lead Applicant have demonstrated qualifications to accomplish the proposed Project?

**Project Resources:** What is the availability of all financial and other necessary resources needed to conduct the work, including the specific financial resources that the Lead Applicant and collaborators commit to the project beyond the requested funding?

**Pathway to Market:** What is the quality and likely achievability of the commercial pathway to market? Is the solution viable in the real world? What integration steps will need to be considered for adoption?

**Commercial Capability:** Do the Lead Applicant and Collaborators have the ability and experience to commercialize the proposed technology?

**Market Barriers:** What is the plan viability relative to technical, legal or economic barriers?

**Financial Stability:** What is the financial stability of the Lead Applicant and key collaborators, especially partners who will be taking the technology into the market?
**Detailed Proposal Evaluations**

*PROPOSALS RECOMMENDED*

<table>
<thead>
<tr>
<th>Proposal: TECG20180006</th>
<th>Lead Applicant: Elysium Therapeutics, Inc. in collaboration with Ohio-based CROs</th>
<th><strong>NOVEL OPIOID ANALGESICS THAT PREVENT ORAL ABUSE AND LETHAL ORAL OVERDOSES</strong></th>
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<td><strong>Total Budget</strong> $5,978,318</td>
<td><strong>Cost Share</strong> $2,989,159</td>
<td><strong>Amount Requested:</strong> $2,989,159</td>
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**Impact**

<table>
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<tr>
<th>Impact</th>
<th>Solution Importance</th>
<th>Solution Uniqueness</th>
<th>Market Pull</th>
<th>Time to Market</th>
<th>Tech Maturity</th>
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**Commercial Readiness**

<table>
<thead>
<tr>
<th>Existing Investment</th>
<th>Team</th>
<th>Project Resources</th>
<th>Path to Market</th>
<th>Commercial Capabilities</th>
<th>Market Barriers</th>
<th>Financial Stability</th>
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</thead>
</table>

**Technology:** Despite all the problems they create, opioids are truly effective at reducing pain, and physicians do not have many viable alternatives for both severe and chronic pain except prescribing opioids. Unfortunately, current forms of opioids have a dose-proportional reward of euphoria, which is one of the factors leading to misuse or abuse. A significant portion of the opioid problem begins when patients themselves begin to exceed the prescribed dose or someone else takes the pills. With oral ingestion of opioids being the most common route of abuse, combating the opioid crisis requires a solution which mitigates this dose proportional euphoria, while maintaining the pain relief provided at proper dosing. The applicant’s parent company, Elysium, has developed a compound, O2PTM (oral overdose protection), which if successful would solve oral misuse or abuse of opioids caused by the desire for the euphoria.

Elysium’s O2PTM can be combined with oral opioids, such as hydrocodone and oxycodone, to inhibit absorption of the opioid if a person takes more than the prescribed dose. The O2P consists of two key subunits combined into a single molecule. One is a “trypsin-activated opioid delivery subunit” responsible for delivering an opioid only upon exposure to the digestive enzyme trypsin in the small intestine. The other is a “trypsin-inhibitor subunit” that provides oral overdose protection by progressive inhibition of trypsin activity as multiple pills (such as in a misuse or overdose scenario) are ingested. This inhibitory effect is calibrated so that at the prescribed dose, ample trypsin is present, and the opioid is released from the trypsin-activated opioid delivery subunit. The promise of O2PTM lies in its ability to greatly reduce the effect of each additional pill that an abuser might take beyond the prescribed dose, thus preventing an overdose.

Current tamper resistant or deterrent opioid drugs have entirely different mechanisms of action. Examples include; Suboxone, Exalgo, Oxecta, OxyContin, Opana ER, Hysingla ER. These drugs have different mechanisms to prevent abuse such as resistance to crushing, formation of a gel if dissolved for injection, extended release tamper resistance, or opioid antagonist inclusion.

O2PTM has been tested in vivo in dogs and in healthy volunteers. It has been the subject of numerous peer-reviewed papers indicating its safety and effectiveness.
Use of Funds: The project that the applicants intend to carry out with a grant from OTF has four milestones:

1. Complete R&D for the process and manufacture of sufficient O2P for subsequent testing for human clinical studies.
2. Studies to enable O2P™ to be classified as an Investigational New Drug (IND).
3. Develop IND package and submit to FDA.
4. Phase I Clinical Trial. Conduct trial to demonstrate proof of concept in humans (hPOC).

Strengths of Proposal: The concept of creating a molecule with two functions, one to release the opioid it carries only in the presence of trypsin, and the other to neutralize trypsin if too much of the compound is present is highly ingenious. In addition to preventing oral overdoses, the mechanism of action for release of the opioid requires trypsin from the small intestine in the digestive track, thus eliminating “snorting” and injection as pathways of opioid abuse. Thus, this proposal holds the promise of revolutionizing opioid prescribing practices. The O2P™ technology has the potential to be a disruptive technology, and game changing in the opioid crisis. The current planned regulatory pathway is 505(b)2.

One can easily see interest from pharmaceutical companies, as this technology would increase sales while reducing the stigma of opioids. If adopted broadly, remaining products without this technology could very well face removal from the market, further incentivizing collaboration from pharmaceutical companies.

The company has arrangements in place for the necessary cost share. The applicants have considerable experience, including Dr. Jenkins who has founded several companies where he led pharmaceutical developments whose technology was later sold successfully. In addition, they have identified cGMP and CRO resources to perform the necessary tasks.

Elysium has a patent on the basic O2P technology, and has filed additional patents to strengthen its position.

Concerns with the Proposal: Concerns which were not sufficient to preclude funding relate to Technical Maturity, Time to Market, and Commercial Capabilities.

While the animal studies in dogs and rats are very promising, there are limited human studies to date, thus the efficacy in human is not fully proven.

Secondly, the anticipated duration for the clinical trial completion, FDA approval, and subsequent drug commercialization, places the time line at the outer edge of Program intent.

Elysium is a California company. They have formed Elysian Therapeutics, LLC, in Cincinnati, with the intent of having the CMO (who is one of the founders) and the Project Manager reside in Ohio to oversee the aforementioned work, and they also plan on utilizing an Ohio-based contract research organization (CRO) and regulatory expert. In addition, Elysium has not yet been able to locate a pharmaceutical manufacturer in Ohio who has the credentials to produce controlled substances.

Recommendations: Due to the uniqueness of the solution, the disruptive nature of the technology in opioid metabolism, and the potential for the State of Ohio to have a significant impact in putting a revolutionary drug on the market, the proposal is highly recommended for funding.
Proposal: TECG20180018  
Lead Applicant: Innovative Medical Equipment  
THERMAZONE THERMAL THERAPY FOR THE REDUCTION OF OPIOID USAGE

<table>
<thead>
<tr>
<th>Total Budget</th>
<th>Cost Share</th>
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Amount Requested: $8,100,000  
Recommended: $177,000

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<tr>
<th>Impact</th>
<th>Technical Readiness</th>
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<tr>
<td></td>
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**Commercial Readiness**

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</table>

**Technology:** Opioids are frequently prescribed for sports injuries or post-surgical treatments. Physicians have few alternatives to opioids to relieve the pain. This proposal, concerns an existing device called ThermaZone, which consists of an electrically powered unit that circulates heated or cooled water through channels in various shaped pads to fit different parts of the body. For example, there are pads shaped to fit over the head, the shoulder, the elbow, the wrist, the waist, the hips, and the thigh. Applying external heat or cold to an injured or irritated region of the body is widely practiced in medicine to alleviate pain, and the applicants believe that ThermaZone may prove to be an effective substitute for opioid drugs.

There are many systems designed for external application of heat or cold to regions of the body, but the applicants assert ThermaZone’s superiority. The device utilizes the thermoelectric effect to cool or heat the circulating water, which means the unit has no moving parts and is almost completely silent in operation. The thermoelectric effect is well-known in physics and is widely used to cool electronic circuitry. A thermoelectric cooler consists of two conductive plates separated by an array of semi-conductors. When a voltage is applied across the plates, one side becomes hotter and the other cooler. If the hot side is connected to a heat sink, that dissipates heat to the surroundings, the cool side falls below ambient temperature. Reversing the voltage causes the device to act as a heater. In the ThermaZone device, a pump circulates water over the heated or cooled plate and through channels in a pad secured to the patient’s body.

The advantages of this system are avoidance of condensation, which troubles systems that use ice; precise temperature control; high reliability with no moving parts except the pump; easy set-up; adapted for continuous operation; quiet; ease of use; and safety.

The ThermaZone heating and cooling unit measures 11” x 4.5” x 4.5”, about the size of a loaf of bread. It has 20 selectable temperature settings, ranging between 38°F and 125°F. The unit retails for about $500 and the pads cost $50 to $120, depending on their size and complexity. IME was founded in 2009, and the applicants state they have sold approximately 8000 units. Although currently being used in hospitals and surgical centers, to further improve adoption rates and customer acceptance, there is a need to for robust clinical efficacy data and corresponding opioid therapy reduction results.

**Use of Funds:** The applicants propose two endeavors to promote ThermaZone as a substitute for opioid drugs. One is a clinical trial to put ThermaZone’s efficacy at relieving pain on a scientific basis. The other...
is a technical upgrade to the device: making it more durable, allowing for alternating heating/cooling, and introducing a digital user interface.

Regarding the clinical trial, the applicants have considerable anecdotal evidence of the efficacy of ThermaZone in relieving pain and reduction or elimination of opioid use. However, most doctors rely on clinical evidence prior to using a new drug or device on their patients. The purpose of the clinical trial is to test the ThermaZone against the current standard of care. It should be noted that the clinical trial will be conducted by two orthopedic surgeons from University Hospitals, which suggests that most of the participants will be orthopedic patients.

**Strengths of Proposal:** Substituting a different (and non-addictive) method for alleviating pain makes the project aligns well with the Program, at least for patients with conditions that benefit from external application of heat and cold. The applicants have considerable anecdotal evidence from The United States Department of Veterans Affairs/ Veterans Health Administration (VA) that the ThermaZone makes a significant impact in the reduction of pain and opioid use.

In addition, the device is easier to use and more precise than the traditional bags of ice or devices which contain ice. Since 8000 devices have been sold, the device is a proven commercial technology.

The applicants have an exclusive license from the University of Texas at Austin for a patent that covers the design of the thermoelectric cooling system. Additional patents have been filed to increase the IP protection.

**Concerns with the Proposal:** Concerns which were not sufficient to preclude funding relate to Scientific Soundness, Solution Uniqueness, and Financial Stability.

Many patients find such cold therapy beneficial, even if a portion of the benefits arises from the placebo effect. In addition, taking a pain-relieving drug generally does not prevent a patient from moving around and performing normal activities while the medication suppresses pain. In contrast, a device like ThermaZone more or less tethers the patient to the device and prevents normal activities during treatment. Several of the articles provided supporting the use of cold therapy utilized compression, so the true impact of temperature was not evident.

While the ThermaZone may have several unique features, there are extant commercial products which provide cold therapy for the targeted applications.

If the clinical trial is inconclusive or proves that thermal therapy has minimal impact on pain alleviation, then the company would be at risk. In addition, reimbursement codes have been removed for these types of devices, suggesting that insurers question the impact of cold therapy.

**Recommendations:** Innovative Medical Equipment appears to be a successful and profitable company, which has been in business for eight years, funded entirely by its founders and by earnings. It has sold approximately 8000 units. The existing product appears to be an adequate substitute for analgesic drugs while the enhanced product is expected to be more suitable for patients in hospitals and surgical centers. The Review Team does not endorse use of State Funds to finance the next generation of a product, when the product in commerce is performing satisfactorily. Further, if the clinical benefits of the device cannot
be proven in a controlled study, then additional investment in a more robust device for the hospital environment would not be appropriate for state funding. Such next generation funding should come from the profits of the company following successful demonstration of clinical benefits. However, the Review Team does recommend funding the clinical trial to verify the effect of cold therapy as an alternative to opioid drugs. If the clinical trial proves the effectiveness of the device, the results can then be utilized to persuade physicians of the utility of the technology as an alternative to opioids. Resultant increased sales and profits could support the ThermaZone Pro upgrade. Funding the clinical trial is highly recommended.
Proposal: TECG20180020
Lead Applicant: Cordata Healthcare Innovations

**Technological Enabled Overdose Intervention, Treatment and Prevention**

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**Amount Requested:** $1,500,000

**Recommended:** $1,500,000

### Impact

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### Commercial Readiness

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**Technology:** One of the challenges for professionals on the front lines of opioid addiction is tracking overdoses and treatments across silos and jurisdictions. A first responder frequently does not know if the patient is experiencing a first overdose, or if they have been using opioids for years and have been in multiple treatment programs. Patients who have completed treatment are often not tracked and their future risk for overdose is unknown. Efficacious interventions without data on outcomes may be overlooked and utilized equally with less efficacious approaches. Overdoses may have discernable (but currently undetected) patterns as ‘bad’ batches of heroin or other substances ripple out from a central source. This proposal, led by Cordata, is actually a partnership of three organizations, all in Cincinnati, which was formed to address this challenge.

1) Cordata Healthcare Innovations, LLC, has invested in utilizing its core technology to develop the Cordata Community solution which provides standard collection of data by leveraging existing patient navigation software to track survivors across jurisdictions. For opioids, this software is modified to specifically manage and coordinate activities of various organizations such as law enforcement, hospitals, first responders, and treatment providers who are responding to the opioid crisis.

2) Interact for Health is a non-profit 501c4 agency, which provides overdose quick response teams (QRTs) and other related services in 20 counties in the Southwest Ohio region. Interact for Health funds grant proposals, policy and advocacy work, research and evaluation, and community organizing activities.

3) The University of Cincinnati’s (UC) School of Criminal Justice has developed a methodology called Core Correctional Practices to train first responders in effective ways to deal with criminal behavior, including “predictive analytics,” to identify people at highest risk for gun violence. The School of Criminal Justice is utilizing the core predictive analytics to indicate areas of high risk for opioid concerns. For example, the analytics have shown that a spike in opioid overdoses in Cincinnati will be followed by a spike in opioid overdoses in Chillicothe six days later.

This collaboration will take proven capabilities in care coordination technology (from Cordata), industry-leading behavior-correction methodologies, and innovative criminal justice analytics (from UC) and integrate the offerings to create a comprehensive solution to maximize the early efficacy Quick Response
Teams (Interact for Health), to enable scalability in the field, and make an immediate impact on the front lines.

Interact for Health will leverage their experience with pre-arrest diversion teams to direct modification of Cordata software to link first responders, treatment professionals, and survivors and more easily connect people to treatment and monitor key outcomes.

The QRTs operated by Interact for Health are in existence, serving 20 counties in the Southwest Ohio region. They originally engaged Cordata to adapt their proprietary software to manage data for the response teams, and that SaaS software is now in use. They also engaged with UC to adapt concepts, originally developed as novel and constructive ways to address criminal behavior, to also attend to addictive behavior. These steps have all been accomplished, so the first-generation technology is operational.

Additionally, the team will leverage the University of Cincinnati’s nationally renowned methodology of Core Correctional Practices (CCPs) to train QRT members, and the newly defined Effective Practices in Community Support for Influencers (EPIC-I) training for key influencers to train first responders and those seeking treatment.

Cordata will allow the early adopters of the technology to participate in the Cordata Opiate Technology Advisory Council, which will meet quarterly to advise Cordata.

The collaboration of these three entities, (the “Cordata Community”) expects to deliver real results in overdose intervention, technology to assess and treat survivors, training methods that increases efficacy of each responder’s interactions, and predictive analytics to identify potential overdoses.

**Use of Funds:** The proposal has three phases:

1. The first phase of delivery focuses on the integration of the disparate community systems that have proven successful independently. This phase involves creation of standardized forms, providing data gathering mobility enhancements for the Quick Response Teams, data capture systems, and security.
2. The second phase focuses on increasing the overall adoption of the Predictive Analytics and Prevention efforts. This phase involves visualization of the data from the Predictive Analytics, recruiting personnel for research, and survivor engagement mobile app development.
3. The third phase of delivery will focus on program performance, improvements, and increased survivor engagement. This phase involves responding to user feedback and providing the appropriate modifications to the program.

The goal of this proposal is to evaluate the programs carried out chiefly by Interact for Health, using Cordata’s management and evaluative software and UC’s training precepts and predictive analytics. Cordata expects that the programs and the supporting software will be improved over the course of the project. Ultimately, they expect that the improved software, together with improved and tested concepts for dealing with opioid overdoses, will be marketed to other counties in Ohio and elsewhere.

**Strengths of Proposal:** The proposal has the potential to be revolutionary for those working directly with people with opioid addiction. It provides communities the tools and data for their response teams to link overdose survivors to treatment professionals, to standardize training systems, and to support the effective engagement of survivors in treatment and intervention. Currently, there is no holistic solution to improve responses to overdoses by providing data across jurisdictions, team predictive analytics, and standardized

Quantum Commerce, LLC Page 16 of 84
training. Since the technology is being adapted, the solution will be available relatively quickly, specifically estimated at two years. The three entities are well funded and have the matching funds.

**Concerns with the Proposal:** Concerns which were not sufficient to preclude funding relate Path to Market, Market Barriers, Market Pull, Financial Stability and IP.

The Review Team perceives a challenge in reproducing the model in other regions because of the unique nature of Interact for Health’s funding model and charter which limits their focus to Cincinnati and surrounding areas. It is unlikely that similar organizations exist throughout the state. In addition, although the technology and programs all exist and appear to be easily adapted, the Review Team is concerned regarding the coordination of three separate organizations. There is no plan to integrate them into a single business entity.

While the program has been deployed in 5 jurisdictions in Southwest Ohio, there is concern about achieving scale and consistent use throughout Ohio. The usefulness of the program diminishes rapidly if, for example, the City of Columbus uses the system, but Franklin County does not because they like a different platform or do not have available resources for adoption. As another hypothetical example, if Hamilton County converts to the Cordata Community but University Hospital which treats overdoses does not integrate into the system, then again, the power of the coordination is significantly diminished.

Although communities and insurers are seeking data as to efficacy and the ability to track addicts across jurisdictions beyond the legal system, there does not appear to be a strong market pull which may well be needed to fund the initiative across the entire state.

The commercialization plan is conversion from the current “freemium” model to paying for software licenses. For the Cordata Platform to have long term sustainability, many taxpayer-supported local entities will need to purchase the program. Despite the potential for saving tax dollars, there remains the typical concern of governmental budgetary constraints.

Since this is a software based solution, there is no patent protection.

**Recommendations:** Due to the solution addressing a critical need, namely the lack of a holistic approach to opioids on the ground, this proposal is highly recommended for funding. In addition, the solution can be readily available.
Technology: Physicians rely on data in order to make the best recommendations for their patients. Currently, there is limited data to guide a physician as to whether a patient is at risk for opioid addiction. This proposal from DeUmbra, Inc., Austin, TX, concerns application of existing computer programs that employ artificial intelligence (AI) and so-called deep learning (implying that the pattern-recognition algorithms in the programs search for patterns not evident in a superficial review of available data) to identify, on the basis of collectible demographic, historical, and clinical information, people with a predisposition for opioid addiction or overdose. To carry out this undertaking, Pulselight™, a startup technology company, also in Austin, TX, has been formed to adapt DeUmbra’s programs to the healthcare industry. Both Pulselight and DeUmbra are owned by the same parent company, Pulselight Holdings. Funding from Ohio will be used to integrate the AI algorithms developed by DeUmbra with the proven Pulselight platform to produce a next-generation web application that actively monitors incoming patient data and alerts healthcare professionals. This initiative for opioids is the first attempt by DeUmbra to integrate the power of their analytics to healthcare.

DeUmbra has been in the cybersecurity business for more than 18 years, using artificial intelligence for military applications. DeUmbra has been successful in complex domains, such as counterterrorism. They have commercialized the tools they have developed. For example, they have a cybersecurity product which was incubated by the Air Force and later acquired by Northrup Grumman. The company has developed high-powered, sophisticated computer programs whose function is to find patterns in available data, and in this proposal, they plan to apply these programs to the challenge of recognizing a proclivity to opioid addiction or overdose based on available data about patients. If successful, such a program could be used to identify patients for whom opioids are being considered and who are likely to become addicts, or for patients currently using opioids who prone to abuse or overdose. Such patients might be treated in other ways or given special training and support to avoid addiction.

The plan will require collection of data, much of it protected under HIPAA rules, from multiple sources (physician notes, hospital records, pharmacy records, insurance claims, law enforcement records, patient histories, etc.), over a period of time.

The product will be a computerized program that can accept specified data and produce an indication of a patient’s likelihood of becoming an addict. This knowledge can then be used by the
prescribing physician, who may recommend other forms of pain relief, special education and counseling, stricter monitoring, or other variations.

**Use of Funds:** The project that the applicants intend to carry out with a grant from OTF has four objectives:
1. Preparation of the data, including acquisition and integration as well as definition of features in the data which are of interest
2. Build and test the model for generating the predictions
3. Modification of the Pulselight platform for integration of algorithms and workflows
4. Modification of the user interface

**Strengths of Proposal:** One of the major entry points for opioid abuse is the prescription for pain. The prescribing physician has no good indicators as to which patients will have a propensity to addiction. If the proposal is successful, the physician would have at his fingertips a dashboard as to the risk of a given patient to being addicted. With this data, the physician can now provide the best therapy for pain relief. There is currently no product of this type, and most physicians strive to be responsible in their prescribing of opioids while providing the best pain relief they can for their patient, thus creating significant market pull for this technology. Similarly, insurance companies would now have the ability to receive proactive alerts for patients at risk for abuse or overdose, allowing them to take action before the patient enters a crisis.

DeUmbra is a well-established company, and leads in the artificial intelligence world, based upon their successful identification of terrorists for military and government entities. Therefore, they have a strong foundation to adapt to this challenge. At the end of the two-year project plan, Pulselight expects to have a viable computer system, which will continue to improve in accuracy as more data is collected. Initial market entry could come within 15 months of the start of R&D activities, though scale-up could take considerably longer.

Due to the cyber security business, DeUmbra has very strong intellectual property and security surrounding its systems. In addition, the investment in the basic technology is significant and the company is financially strong.

**Concerns with the Proposal:** Concerns which were not sufficient to preclude funding relate to Path to Market and Market Barriers.

DeUmbra is extraordinarily well qualified in the artificial intelligence space, but their sister company Pulselight is relatively new to the healthcare space, leveraging their platform for simpler applications like health plan compliance and drug utilization reviews. Also, there are concerns as to whether they will be able to obtain access to the sufficient quantities of health and other records; of potential liability if they fail to indicate a person could become an addict; and regarding who will pay for the program. Finally, they will need to establish an Ohio based office and place special focus on collecting and analyzing Ohio patient data to drive near-term impact in this state.

**Recommendations:** Due to the need for physicians to have data-based guidance in order to determine the best path for pain alleviation, insurance companies’ needs to control costs and improve outcomes, and DeUmbra’s extraordinary strong credentials in the area of data analytics, this proposal is highly recommended for funding.
Proposal: TECG20180005  
Lead Applicant: Sober First LLC dba Ascent  

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**Technology:** One of the major challenges in treating addiction is placing people with opioid addiction into treatment programs and keeping them engaged in treatment, including helping them past the triggers to use. Sober First, LLC, doing business as Ascent, proposes expansion of a Substance Abuse and Mental Health Services Administration (SAMHSA) based service that it now offers to treatment facilities for drug addicts: a round-the-clock hotline connecting people battling addiction in recovery with peers (volunteer recovering addicts) and peer coaches (paid and certified coaches who are frequently in recovery).

Ascent is partnered with an opioid addiction treatment facility in Cleveland called New Directions, which offers services such as partial hospitalization, day treatment, and residential short-term treatment. One aspect of their treatment is a hotline that treated addicts can call to get support from “peer recovery coaches,” that is, former addicts who have been trained as coaches, who are thought to be best equipped for this role because they know first-hand what it is like to be an addict. These coaches have 40 hours of certification training from the state and an additional 40 hours from Ascent. Ascent provides this service for New Directions (both a primary customer and investor), currently with a call center staffed by a dozen or so coaches serving about 400 recovering addicts, who use their own cellphones to reach the center. New Directions reports a 20% increase in graduation from their program and a reduction in treatment days by 90 days due to having the Ascent service solution. In addition, the app is part of their continuing care program, post-graduation. Ascent’s approach increases client interaction, connectivity and sense of community which in turn increases compliance, driving the dramatic improvement in outcomes they have measured.

A key part of Ascent’s service is a smartphone app, called the Ascent Solution, which extends the capabilities of a cell phone beyond being just a communication device to connect to a hotline. The app itself contains more than connection to the call center. The Ascent Solution provides a safe, stigma-free, HIPAA-compliant means of communication, sober support, and organization. The app includes medication reminders and calendar tools, podcasts, personal motivation profiles, peer chat groups, and trigger mapping (for example, warning a user that addict is entering a GPS-located zone where relapse is more likely), real-time chatting and 24/7 crisis intervention. Pairing algorithms match clients with peers and coaches. A critical element of the app is the ability for an addict in crisis to connect with a live person or with a peer group with a touch of a button (called a Beacon) on their smart phone.
The company sees its business growing in the future as it expands the number of treatment facilities that it serves. In addition, the company expects that other entities will offer peer recovery coaching services and will purchase the Ascent Solutions app to do so. To promote usage and learn more about the actual utility of the features in the improved Ascent Solution, the company plans to offer it without charge for six months. The idea is to expand the client base for Ascent’s services in the same manner that magazines offer a limited number of free issues in the hope that readers will convert later on to purchasers. They then plan on having the treatment centers pay for the service at a rate of $35 per month for each user.

**Use of Funds:** Currently, Ascent is renting the app. They intend to build their own app and improve functionality in order to provide scalability. The Work Plan presented in the proposal lists: mockups, wireframes, validate, persona mapping, design mapping, and focus group testing. The net result would automate repetitive functions to free up peer time for 1:1 coaching, ensuring HIPAA compliance, expansion of the user base, and resources for the addict’s support team. The remainder of the funds will be used to expand the services offered by Sober First.

**Strengths of Proposal:** The usefulness of the app and service is proven by New Directions. Further development of the app to automate key functions will free up coaches to focus on client needs on demand. Creation of chat groups with similar users (e.g., addicts who are also diagnosed with schizophrenia) increases the sense of connection and purpose that addicts need. While the underlying business model is still relatively undefined, the proven improvements in treatment rates show this model is effective and the app will improve scalability, thereby lessening the business model risks.

**Concerns with the Proposal:** Concerns which were not sufficient to preclude funding relate to Team, Path to Commercialization, and IP.

The president of Ascent lacks experience leading a growth company, as is demonstrated in a very optimistic customer acquisition model. Even if successful the operational challenges of hiring, training, and managing a rapidly growing business will require an experienced leader.

As a promotional thrust, the applicant plans to offer the software without charge for a limited time in order to build up the user base, but their business plan is fee for service at a rate of $35/user/month to be paid by the treatment facility. Conversion from freemium model to paying model is often more challenging than expected. In addition, the applicant will need to scale the number of peer coaches to meet the additional client volume.

Up until now, Ascent has operated in a local environment. When it seeks to expand, others are likely to offer a competitive response to the Ascent Solution.

The proposal acknowledges that the Ascent Solution “has no patentable content.”

**Recommendations:** Completing outpatient treatment and maintaining sobriety is incredibly difficult, and people in recovery often need 24/7/365 support. By providing this application for social networking (community) to connect peers with one another and peer recovery coaches, by providing tools/education, and by matching clients with peer coaches or other peers with similar experiences to develop relationships/increase support, the app is providing the needed support to increase the success rate. Thus, the proposal is recommended for funding.
Proposal: TECG20180013  Lead Applicant: Sollis Therapeutics

A LONG-ACTING NON-OPIOID TARGETED DELIVERY ANALGESIC FOR SEVERE SCIATICA PAIN

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### Commercial Readiness

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**Technology:** Sollis Therapeutics, Columbus, OH, is the second company formed by the OTF-supported Neurotechnology Innovation Translator (NIT) at Ohio State University. The company proposes completing the development of a new treatment with a repurposed drug, clonidine, which was developed in the 1950s and used as an anti-hypertensive and anti-anxiety drug. It is currently used for relief of pain due to its anti-inflammatory properties coupled with its analgesic properties. Clonidine as a liquid was FDA approved in 1996 for spinal epidural administration for regional pain syndrome, neuropathic pain and persistent pain. Clonidine has been used in intrathecal pumps (via spinal canal) for the control of chronic pain, and in other pain management applications. The problem is the duration of relief from pain post application of the liquid. The proposed solution is to encapsulate clonidine in slow-release micro-pellets and to place the pellets in the spinal cord through an epidural injection as a treatment for sciatic pain.

The sciatic nerve is the longest nerve in the body, extending all the way from the foot up to the lumbar spine, where it enters the spinal cord. If injured somewhere in the leg or hip or if pinched by a defective disk or narrowing of the spinal cord, the nerve sends a pain signal called sciatica. Treatments include surgery to repair a defective disk or open a narrowed spinal cord, physical therapy, and drugs, including opioids that lessen the pain. Sciatica is a relatively common condition and even a conservative 1% annual incidence rate would equate to more than 100,000 affected Ohioans. While there are complex assumptions for various treatment modalities within this population, the Review Team agrees with applicant assertions that this therapy could protect 18,000 Ohioans annually from exposure to opioids and 1,000 or more would therefore not spiral into addiction.

Sollis Therapeutics proposes to insert tiny, timed-release capsules into the spinal cord through a cannula (a hollow needle) inserted through a lumbar disk (the soft pad between vertebrae) and through the dura (the tough membrane that surrounds nerves in the spinal cord). The capsules are 0.75 mm in diameter and 4 mm long (about a sixth of an inch). The encapsulating material melts away gradually, releasing clonidine for a period of about a month, and the anticipation of healing without additional pain treatment. By providing nerve blocking and anti-inflammatory effects, this compound (STX015) has been shown to reduce sciatic pain to a significant extent.
Animal studies to establish proof-of-concept, tissue distribution, pharmacokinetics, and safety have been conducted. The Phase II clinical trial used variable numbers of pellets and demonstrated that the pellets provided “significant pain relief with no drug-related adverse effects.”

The technology was originally developed by Medtronic as part of its strategy to move upstream into anti-inflammatories which would use the company’s expertise in the development of the delivery device. Medtronic has determined that drug development is currently not part of the company strategy, but is investing in further development via the NIT to Sollis. Medtronic does have 5% equity in Sollis and options on the technology with a term sheet for a potential buyback in place. An independent valuation will be set once development is complete and if Medtronic does not meet the valuation, Sollis can exit the deal and seek other investors. To license the technology, Sollis must have a minimum investment, of which this grant would be a significant portion. There is a term sheet for a lead investor, with an expected close by year end.

**Use of Funds:** The original proposal indicates Sollis will perform “two pivotal studies” necessary to gain FDA approval. However, the addendum and interview responses to questions indicate Sollis Therapeutics expects to have an approved and marketable product in 30 months. This change is the result of discussions with FDA that convinced the company that it could dispense with the second pivotal study if it performed a safety study as part of the first study. The company also learned that the FDA believes the project will qualify for “Priority Review” because of the need for a non-opioid way to treat sciatic pain.

The project that the applicants intend to carry out with a grant is the pivotal trial, which will measure pain scale improvements vs. sham, as well as the safety study.

**Strengths of Proposal:** There has been considerable investment, $30 million to date, in this technology. The drug itself is well known for its ability to alleviate pain. What is needed is the slow release, which this technology would provide. Currently, there are 10 million injections/year for sciatica pain, at a cost of approximately $6000/patient. Patients typically receive multiple injections, and the applicant indicates there could be a notable cost savings. If the studies provide the expected results, STX 015 would supplant use of steroids currently used in epidural steroid injections for the sciatica and herniated discs. Thus, it is anticipated that pain physicians would readily adopt the technology.

As the majority of the clinical work is complete, and the two pivotal trials are being combined into one, the estimate is 30 months for approval and commercialization.

The intellectual property is strong, and lasts until 2029.

**Concerns with the Proposal:** Concerns which were not sufficient to preclude funding related to Impact, Project Resources and Path to Market.

The Impact is only incremental, since initially the technology is for only one target: sciatica pain. While a large market overall, it is still a relatively narrow population for chronic pain. In addition, with the limited indications for STX 015, it would reduce but not eliminate the use of steroid injections. Often patients are already on or have tried opioids through physician prescribing before they are referred for injection treatment. Thus, this technology is not necessarily a complete opioid solution but rather a tool for managing
sciatica instead of using non-FDA approved steroids (corticosteroids are not approved for injection into the epidural space of the spine).

The requested budget is $5,000,000 which is 40% of the allocated funds for the OOAPTTI. While the applicants state they need these funds to achieve an equity milestone required as part of their licensing terms, they do not provide a compelling justification for this specific amount. Considering Medtronic’s involvement, past and future support of indirect state funds via the NIT, compelling phase II data, and relatively short time to market, it is likely the applicants can raise a portion of the requested funds via dilutive equity.

Medtronic is investing in Sollis via NIT, and has plans on buying the technology back if successful. There is limited return for the State of Ohio in making this investment. Medtronic is not an Ohio company, and manufacturing will occur out-of-state. In essence, the State of Ohio is de-risking the technology and may not realize significant direct economic benefit. However, the purpose of the grants is not economic development for the State of Ohio, but rather solutions for the opioid crisis, and Ohio will realize benefits in that regard.

**Recommendations:** Due to the relatively short time to market, and providing a unique solution that would be FDA approved for the treatments of sciatica, the proposal is recommended for funding. However, a reduced award amount of $2MM is recommended for the reasons described above. This still provides a commercial acceleration impact without over-investment in a single solution to the opioid crisis.
**Proposal:** TECG20180022  
**Lead Applicant:** The University of Akron  
**POST-OPERATIVE PAIN MANAGEMENT USING THERAPEUTIC MESHES**

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**Commercial Readiness**

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**Technology:** Postoperative pain control is an important challenge for anesthesiologists and surgeons. Postoperative pain can be a gateway for opioid abuse and misuse. The project directly addresses this challenge by substituting a drug-eluting mesh containing a local anesthetic for administration of a pain-relieving medication at the surgical site; with the expectation that three or four days after an operation has been completed, the pain will have subsided to a level manageable with over-the-counter pain medicines.

This proposal from the University of Akron, in conjunction with 21st Century Medical Technologies (21MedTech), aims to develop a resorbable (capable of breaking down into its component materials, which are then dispersed in the circulation) plastic mesh to be inserted at the time of surgery in a surgical wound where it would gradually release a non-opioid local anesthetic, such as lidocaine or bupivacaine, over a period of three or four days, after which acute surgical pain usually subsides and remaining pain is controllable using non-prescription drugs, such as ibuprofen (e.g. Motrin) and naproxen (e.g. Aleve).

For the mesh, the applicants have selected a class of degradable polymers called PEUs, or polyester ureas, which have the necessary properties with regard to degradability, biocompatibility, manufacturability, sterilization, etc., and which were developed at the University of Akron. By changing the constituents these polymers can be made tunable, that is, the rate at which they are resorbed can be tuned to be faster or slower. In addition, the inventors can control the rate of elution of the anesthetic.

The applicants have three candidates for the local anesthetic: lidocaine, bupivacaine, and a third undisclosed COX 2 inhibitor compound that belongs to Merck & Co., referred to as MPC (Merck proprietary compound). Lidocaine is the familiar local anesthetic injected by doctors and dentists prior to minor surgical or dental procedures, and its “cousin” bupivacaine is used when procedures are expected to last longer. These compounds work by inhibiting signal transmission along nerve fibers, and the numbing effect typically lasts for an hour or two. For this reason, it is necessary that the mesh that carries the anesthetic itself should dissolve at a much slower rate to allow anesthetic to be released over a period of three or four days. 21MedTech, which will collaborate with the University of Akron on this development, is an existing small business, which, among other things, has acquired exclusive licenses from the Becker Laboratory of Functional Biomaterials for PEUs, which are key to developing meshes with the desired properties. The company seems to be well-funded, and the proposal says that 21MedTech has committed to contribute $1,728,000 to the project.
The applicants believe that FDA approval should be sought under 505(b)(2), which allows applicants to cite published research done by others, which will be appropriate for lidocaine, bupivacaine and MPC.

**Use of Funds:** The project that the applicants intend to perform with a grant from OTF has three major milestones:

- **Milestone 1:** Develop optimized PEU formulations that will deliver appropriate concentrations of lidocaine, bupivacaine and a proprietary Merck compound.
  - SubAim1.1 - Synthesize degradable poly(ester urea)s for study
  - SubAim1.2 - Characterize drug distribution in poly(ester urea)s films
  - SubAim1.3 - Optimize in vitro drug release profiles for pain medications from poly(ester urea)s films
  - SubAim1.4 - Develop GMP synthesis of optimized poly(ester urea)s formulations

- **Milestone 2:** Optimize the fabrication of clinical prototypes of the drug eluting surgical meshes
  - SubAim2.1 - Optimize computational models for drug binding to poly(ester urea)s
  - SubAim2.2 - Optimize Roll to Roll fabrication of drug loaded in poly(ester urea)s films
  - SubAim2.3 - Optimize sterilization technology for drugs loaded in poly(ester urea)s films

- **Milestone 3:** Validate the Fabrication, Packaging and Regulatory Strategy for the drug eluting surgical meshes
  - SubAim3.1 - Validate GMP fabrication of the optimized pain medication eluting mesh
  - SubAim3.2 - Optimize and validate packaging for the drug loaded pain eluting mesh
  - SubAim3.3 - Coordinate regulatory strategy and verification

**Strengths of Proposal:** This proposal is a unique pain management option for postoperative pain control. If it does not eliminate opioids for postoperative pain control, it should decrease their use. Postoperative pain management is a multimodal approach requiring anesthesiologists, surgeons and hospital staff to apply various methodologies. The drug eluting mesh would be another tool in ERAS (enhanced recovery after surgery) protocols already in place.

Despite the relatively short duration of drug release (~72 hours) the applicants have cited literature to show that opioid avoidance in this critical post-operative period correlates to greatly reduced opioid utilization during the entire recovery period.

The new product is based on the degradable characteristics of PEUs, which are composed of substances normally found in the body, implying that there is little risk that the compounds will be found unacceptable. The anesthetics that are candidates for inclusion in the device have a long history of safe use (except for MPC, about which little information is available). In short, there are strong reasons for expecting this project to yield a useful substitute for opioid drugs.

**Concerns with the Proposal:** Concerns which were not sufficient to preclude funding include Technical Maturity, Impact, Time to Market, and Market Barriers.

The technology is past the conceptual stage, since the proposal cites multiple measured and tested characteristics of the degradable polymers, such as their composition, stability in storage, tensile strength, Young’s modulus, and in vivo degradation. The Becker Laboratory has demonstrated that the polymers can be formed into thin films as desired for the intended application. However, little work has been completed on incorporation of the drug into the mesh. There have been no clinical trials to prove the drug eluting mesh really does reduce opioid intake. Thus, it is too early to register for an Investigation Device
Exemption (IDE). Despite the involvement of 21 MedTech all work to date has been performed at UA, leaving a lot of unknowns in the commercial and investment space.

Because the new device is aimed at and relevant to significant surgical procedures, it has a relatively small potential to significantly impact the opioid crisis. For example, it is inapplicable to most dentistry and to most chronic pain that is not treatable surgically.

Finally, although the use of meshes is a well-established surgical procedure, there is always the risk of infection. Surgeons will carefully consider the additional risk versus benefit which could slow uptake.

The current best estimate as to time to market is 5 years.

**Recommendations:** Given the ability of this technology to substitute local postoperative pain management over systemic opioid use, the project is recommended for funding.
Technology: One alternative to the opioid crisis is to replace opioids with technologies which relieve pain without any medication. One such alternative is neurostimulation. Nerve stimulation as a means to treat chronic pain has been around for nearly 50 years. Generally, a low-level pulse is applied to tissue in the vicinity of nerves in the limbs or nerves in the spine. Doing so has been found to be beneficial for about 30% of patients suffering chronic pain. It is believed to work because the pulses create a signal that overwhelms the pain signal so that the signal that reaches the brain is not perceived as pain.

In this proposal from Neuros Medical, Inc., the mode of action of the neurostimulation differs from the conventional methodology. Instead of overwhelming the pain signal, the alternating current paralyzes the sodium pathway in nerve cells, blocking the pain signal. In this respect, the action of Altius is similar to the action of local analgesics like lidocaine. The device is implanted, but now it is under the wearer’s control. It provides a low-level alternating current at 5-50 kilohertz (5,000-50,000 cycles per second) to an electrode that has been placed near what is known or what is believed to be the nerve producing the sensation of pain. Experiments performed to date suggest that this method may reduce pain to levels where 80% of patients no longer need pain-alleviating drugs.

Neuros Medical was founded in 2008 to develop the Altius neurostimulation technology. Their first target for therapy is post-amputation pain (PAP). Following amputation of a limb, many patients endure severe pain, sometimes in the remaining stump, and sometimes seeming to emanate from the phantom limb. The source of this pain is thought to be an out-of-control nerve regeneration at the terminus of severed nerves. This fact makes PAP a good candidate for initial market penetration because it is a finite, easily identified site to place the cuff-like electrode of the Altius System around one of the long nerves. Later on, the company plans to address post-surgical pain, migraine and trigeminal neuralgia, and other forms of chronic pain.

Currently, Neuros has an ongoing Pivotal Study which involves 130 amputees at 15 sites for a 12 month follow up to evaluate safety and efficacy of Altius.

Use of Funds: Prior to commercialization, 6 critical tasks remain:
1) Completion of Pivotal Study: this task is on-going and does not utilize any OTF funds.
2) Regulatory Strategy Implementation (OTF, $500K) includes CE Mark and PMA submission
3) Manufacturing Strategy Implementation: does not utilize any OTF funds
4) Reimbursement Strategy Implementation: Includes working with CMS and private payers for reimbursement approval. This does not include any OTF funds
5) US Market Launch (OTF, $1.3MM) includes building a marketing and sales team
6) Clinical Publication (OTF, $200K) includes publishing the results of the pivotal study

Thus, the primary use of OTF funds is for building the sales and market teams, with a small amount for regulatory implementation.

**Strengths of Proposal:** Work at Case Western Reserve University in the 1990s resulted in two patents covering the basic technology embodied in Altius. The company holds a license from CWRU for development of covered devices. In addition, the company has 16 patents in review and 10 issued patents on the technology, an unusually strong portfolio of IP protection, that creates a significant barrier for competition. The organization has attracted strong financial backing and commercial viability is robust. As a nerve block, the technology differentiates itself from nerve stimulation.

With the majority of the clinical work completed, and the pivotal study in process, the time to market is 2 years. The platform technology will then be expanded to additional indications in the near future.

**Concerns with the Proposal:** Concerns include Impact, Solution Importance and Project Resources. Although the technology is viewed as a platform, the initial indication is for post-amputation pain, which is a comparatively small subset of patients with chronic pain. In addition, the target patients, for the implantation of the Altius system, may have been on opioids for some period by the time they have the surgery. This can present as a resistance to reduction in dosage. Finally, with having recently raised $20MM in Series AA funding, the need for additional State grant resources is difficult to justify.

**Recommendations:** The requested funding amount, although a small percentage of the proposal budget, is disproportionately allocated for sales and marketing activity, which does not align with the intent of the Program. Further, with the applicant’s recent successful fundraising, they have sufficient resources to execute their commercialization. Due these factors coupled with the above identified concerns, this proposal is not recommended for Program funding.
Technology: A clearly defined problem associated with the opioid crisis is effective treatment to manage withdrawal symptoms, that is, a treatment regimen that is not too difficult for patients to endure and that is sustained after treatment stops with a limited relapse rate. The application from Atalantos Biotechnology, LLC, proposes a proprietary pharmaceutical called Aphesin, a compound of nicotinamide adenine dinucleotide (NAD) and certain over-the-counter, non-addictive analgesic medicines, as a solution to this problem.

NAD is a naturally-occurring coenzyme found in all living cells. It has been used as a component of medicines for a variety of ailments, including schizophrenia, Parkinson’s, Alzheimer’s as well as drug and alcohol addiction. NAD intravenous treatment results for opioid withdrawal are promising but can have several side effects such as neck pain, dizziness, nausea, shortness of breath, flu-like symptoms, diarrhea, etc. These side effects can be managed by slowing the infusion, which lengthens infusion times to 12-24 hours. The Aphesin formulation, which is NAD plus non-addictive analgesics, claims to improve efficacy and lessen side effects, allowing for shorter infusion times.

Luna Living, an accredited mental health facility in Chagrin Falls, OH, has used Aphesin to quickly and safely help their patients detoxify from opiates. Patients who complete their Aphesin regimen then go on to standard outpatient therapy, achieving a success rate of 86% of treated patients maintaining long-term abstinence from opioid drugs, which is far higher than the success rates with other treatments.

Currently, the most used FDA-approved methods for weaning addicts from drugs are Medication Assisted Treatment (MAT) and Opioid Replacement Therapy (ORT), both of which substitute another drug, such as methadone, for the opioid. These methods are far from satisfactory because side effects of the substitutes can be almost as bad as the symptoms of withdrawal, including nausea, cramps, sweats, chills, muscle and bone aches, vomiting, diarrhea, agitation, tremors and drug cravings. Such symptoms can persist for weeks, months, or even years, contributing to high relapse rates.

Aphesin contains NAD and over-the-counter analgesics, which, because they are considered safe, do not require any approvals. It has been used in 80 patients at the Luna Living Recovery Clinic with far greater success than any other existing alternative. However, the FDA recently proposed to remove NAD from the 503A Bulk Compounding List, primarily due to concerns about drug stability. Because NAD has never
been approved in the US, continued use will require an investigational new drug designation and clinical studies leading to eventual FDA approval. Atalantos proposes to bring Aphesin to market as an FDA-approved drug for treatment of patients addicted to opioid drugs. The proposal covers the first two years of the drug development process necessary to gain FDA approval.

**Use of Funds:** The project that the applicants intend to carry out with a grant from OTF has seven major milestones:

1) Establish and maintain Institutional Review Board (IRB)
2) Formulate and Validate the Active Pharmaceutical Ingredient (API)
3) Develop the Drug and Manufacturing Route
4) Bioanalytical Analysis
5) Toxicology Analysis
6) IND submission and approval
7) Initiation of Phase 1 Human Trials

**Strengths of Proposal:** The advantages of Aphesin, if true, are significant and surprising. A compound which can contribute to an 86% long-term sobriety rate would be unprecedented. If Aphesin lives up to its promise as an effective treatment for opioid drugs, without the serious side effects known to be associated with substitution treatments like methadone and buprenorphine, it should have no difficulty becoming the treatment of choice for opioid addicts. Applicant and collaborator are on the front line of combating the opioid crisis, and have considerable experience in the treatment of addicts.

**Concerns with the Proposal:** Concerns include Time to market, Technical Maturity, Commercial Barriers, Path to Market and Scientific Soundness.

Aphesin is very early in the drug development cycle, and has not been registered with the FDA as an Investigational New Drug (IND) because, up to this point, it has not been required to do so. While NAD is not approved by the FDA, it is on the FDA 503A Compounding Bulk List of compounds considered safe for incorporation in pharmaceuticals, and NAD is one of these compounds. Recently, the agency has announced an intention to strike NAD from the list on the grounds that, although it has been in use for decades, it has not been adequately tested for health impacts nor have its manufacture and storage properties been adequately studied. The lack of stability is causing the mode of entry to be intravenous drip, causing at least partial hospitalization. The company plans to address this problem by working with an Institutional Review Board (IRB) to oversee treatments. IRB oversight is a standard way to pursue investigation of new drugs or new medical or surgical techniques before they are subjected to the full panoply of testing necessary for FDA approval. Thus, the commercial path is long, with the projected time in market in 2024 in the proposal, but during the interview the timeline was shortened to 2022 and with the typical costs of drug development in the $50 million range.

In addition, all evidence provided by the applicant must be considered anecdotal. There have been no controlled clinical trials to date, no peer reviewed literature on Aphesin, nor any other way to corroborate the applicant’s claims before making a significant investment of state funds.

The team does not have a clear line of sight to the $50 million needed to bring this combination drug to market.
Recommendations: Despite the potential impact of Aphesin, concerns remain with the long time frame to market, the concern by the FDA for NAD, and the lack of controlled experimentation as to efficacy. Due to the above identified concerns, this proposal is not recommended for Program funding.
Technology:

At-risk populations, such as opioid users, may fall through the cracks of a segmented healthcare system. By providing an integrated technology system for coordination of care, Care Coordination Systems (CCS) is addressing the need of individuals that may need support services. Care coordinators can refer opioid users to the appropriate medical, social service, or government program, and then track their progress.

CCS proposes extensions of its main product, Pathways HUB Connect (an existing computerized system for coordinating care), development of new teaching materials, and training of care coordinators in dealing with opioid abuse.

CCS is an Ohio corporation, founded five years ago, that markets software systems designed to coordinate care to agencies that manage healthcare for a segment of the local population. The company also supplies training and educational materials to its client agencies, now numbering 44. Pathways HUB Connect is the name of the software. It embodies the principles of a model for care, called the Pathways Model, with three operations: Find, Treat, and Measure:

- Find means identify, assess and enroll
- Treat means develop, implement and monitor care plans
- Measure means document and evaluate progress and outcomes.

This proposal focuses on coordinating care of opioid users, who, even if they are not abusers or victims of overdose, are at risk for becoming so. The Care Coordinators would enter data into the system, would select one or more pathways of care, and as the user is assisted would enter data along the pathway. Ultimately, the pathway is completed, and if not, the Care Coordinators supervisor receives an alert.

Use of Funds: Specifically, the project in this proposal will produce the following:

1. A mobile app to allow first responders and partners to refer opioid users to appropriate coordinators using Pathways HUB Connect.
2. Assessment and treatment “tools and resources,” tailored to the needs of opioid users.
3. A mobile app for individual self-assessment and access to educational materials.
4. An opioid training program for care coordinators.
5. Programming for direct information exchange with three of the top four Electronic Medical Record Systems (Epic, InterSystems, Athena)
6. An Ohio-based National Center of Excellence for Pathways.
7. A review of the Pathways system architecture to increase scale

**Strengths of Proposal:** The adaptations are expected to be completed and tested in the two years following award. The project proposed by CCS appears to be technologically achievable, being an evolution of the existing technology to include risk factors associated with opioid use. The Pathways technology is already in use, providing coordination of services and has demonstrated success with multiple at-risk populations. Applicants are focusing on current healthcare trend of providing value, not volume.

**Concerns with the Proposal:** Concerns include Impact, Team, IP, Commercial Pathway, and Solution Importance. A streamlined care coordination is helpful, but the actual achievement of the goals of the Initiative depends on the agencies that make use of the program. Computer programs usually do not solve problems; they only facilitate solutions.

Of the seven goals laid out in the plan for this project, three seem outside the scope of the OOAPTTI, which is focused on technology:

- Tools and resources tailored for opioid users.
- Training programs for care coordinators
- National Center of Excellence.

The Business Model, including funding, was not well articulated.

The team lacks experience with opioids and offered tangential experience in the in-person interview, for example operating a call center. For cost share they plan to bill the CEO at $250, and the physicians at $400, with $200 being counted towards cost share.

The IP embodied in the Pathways software is not protected by patents but by copyrights and trade secrets, as most software programs are.

The grant applicants state they are constrained by lack of staff, yet the grant is not providing staff functions. The Review Team is not convinced that there is a cohesive strategy behind this program and therefore is uncertain whether the initiative would have a significant impact on the opioid crisis.

**Recommendations:** The CCS team is passionate and opportunistic but lacks a clear vision for how to drive success in a highly fragmented market with diverse needs across jurisdictions. Further, concerns remain on cost share derived from high billing rates. Due to the above identified concerns, this proposal is not recommended for Program funding.
Proposal: TECG20180024
Lead Applicant: SPR Therapeutics

COMMERCIALIZATION OF THE SPRINT SYSTEM, AN INNOVATIVE MEDICAL DEVICE ALTERNATIVE TO OPIOIDS FOR THE TREATMENT OF CHRONIC BACK PAIN

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Commercial Readiness

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Technology: One option to prevention of opioid addiction is to provide an alternative technology to drugs, and thus never expose a patient to opiates. This proposal from SPR Therapeutics, (SPR stands for Stimulation for Pain Relief) is for a 510(k) FDA-approved, electrical, peripheral nerve-stimulating (PNS) device called SPRINT, which is a drug-free, minimally invasive and completely reversible pain management alternative. It is inserted by a physician during an outpatient procedure and without the need for general anesthesia. The SPRINT PNS System uses a small, wearable stimulator connected to a thread-like wire lead to deliver tiny electrical pulses to stimulate nerves in a manner that is intended to provide targeted pain relief. The lead is intended to remain in place for up to 60 days, after which it is withdrawn, again in an outpatient procedure. The external stimulator is approximately the size of a matchbook with several control buttons, and is fastened to the skin with adhesive.

Electrical nerve stimulation is not a new technology but is one whose efficacy is still not fully proven. Some studies show significant efficacy and while others do not. There are many devices already approved and on the market, with which SPRINT will be competing, among them St. Jude Medical’s Eon Neurostimulators, Stimwave’s Tiny StimQ Wireless Peripheral Nerve Stimulator, SJM’s Epiducer Neuro Lead Delivery System, and St. Jude’s Epiducer Percutaneous Lead Delivery System.

A unique feature of SPRINT is the coiled wire lead, which resembles a screen door spring. This structure provides the lead an elastic property, so it bends and stretches easily with normal bodily motions. The shape also promotes growth of tissue into the coils, thus anchoring the lead and diminishing the chance of motion of the lead at the insertion site, which can cause irritation and possible infection.

The only way to test efficacy of a pain-relieving device is to ask patients whether their pain is diminished and perhaps to “quantify” it by asking them to rank the degree of pain on some numerical scale. The evidence for efficacy is not overwhelming since 60% of patients found at least a 50% reduction in pain with SPRINT, while only 30% did so with a sham treatment.

SPR Therapeutics is a subsidiary of Neuro Device Innovations.

Use of Funds: This requested money is to hire more sales and marketing people, and to support randomized trial to support reimbursement.
Specifically, the objectives of the program are:
1) Establish commercial pathway to early sales of the SPRINT System through initial VAC (Value Analysis Committee) approvals and reimbursement traction.
2) Confirm non-opioid pain relief, eliminate or minimize usage of opioids and other analgesics, and reduce disability in a large randomized controlled clinical trial of the SPRINT System.
3) Demonstrate accelerated growth of VAC approvals and reimbursement traction needed to make the SPRINT System available at health care facilities throughout Ohio and across the US.

Strengths of Proposal: SPR Therapeutics has been formally in existence since 2011. The company has been extremely successful in raising funds and has just completed a significant equity raise. $3.5 million of that raise will be combined with OTF funds of $2.86 million, to provide the company with the amount required to fully commercialize the product and capture 10% of the market.

The product has completed FDA approval and is ready for commercialization.

The patent portfolio is very robust with 109 patents.

Concerns with the Proposal: Concerns include Impact, Solution Uniqueness, Scientific Soundness and Market Pull.

While SPRINT meets the goals of the Program, so do many essentially equivalent devices already on the market. Therefore, the Review Team does not foresee another nerve-stimulating device will make a significant impact on the opioid crisis.

The data presented in the proposal certainly indicates a statistically significant improvement in pain relief, but it is not overwhelming, and it was not tested against similar competitive devices.

The requested funding from the state is primarily directed towards commercialization activities which will speed time to market and adoption. While this approach is beneficial to the applicants, additional funding from the state will do little to change the opioid landscape as the technology will be commercialized with or without state funding.

Recommendations: Due to the above identified concerns, this proposal is not recommended for Program funding.
Proposal: TECG20180033  
Lead Applicant: Cincinnati Children’s Hospital

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**Impact**

**Technical Readiness**

**Commercial Readiness**

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**Impact**

**Solution Importance**

**Solution Uniqueness**

**Market Pull**

**Time to Market**

**Tech Maturity**

**Scientific Soundness**

**IP**

**Technology:** It is well-established that many people with opioid addiction became addicted because of exposure to legitimately prescribed drugs following major surgery. As a subset, adolescents are of a concern because they have less coping skills than an adult. Also, unlike a child who is closely supervised, a postoperative adolescent may have more of an opportunity to access opioids. Therefore, part of combating the opioid crisis needs to be prevention of opioid addiction in adolescents who are exposed to opiates postoperatively or after being treated for injuries. To address this concern, Cincinnati Children’s Hospital Medical Center (CCHMC) proposes development of preoperative tests, based on genetic testing and other factors, to ascertain a measured, postoperative dose of morphine adequate to alleviate pain effectively while not inducing respiratory depression and other adverse effects of the drug. The applicants have created such tests for neonates and plan to develop them for adolescents undergoing major surgery. If this project is successful, the applicants believe that the resulting panel of tests will also be applicable to adults.

Opioids are routinely prescribed after major surgeries because they reliably alleviate postoperative pain. Every patient reacts differently to these drugs; some patients require larger or smaller doses than others, and some patients are more prone to abuse or addiction from this exposure than others. The aim of this proposal is to develop a panel of tests that will predict an individualized dose that can be expected to adequately relieve pain and avoid undesired consequences including a tendency toward abuse, diversion, or addiction.

The applicants have already developed such a system for neonates, called NeoRelief Morphine Precision Dosing Tool. The proposal is for extension of this tool to the adolescent population in the hospital and after discharge, when patients may suffer from chronic postoperative pain. Though adolescents are not adults, the applicants expect that developing a system for adults will be easily accomplished once the adolescent model is developed.

The basis for genomic testing portion of this project relies heavily on pharmacokinetics (PK), pharmacodynamics (PD), and pharmacogenomics (PG) to help develop a more precise opioid dosing guide. PK refers to movement of a drug into, though, and out of the body. This includes absorption, bioavailability, distribution, metabolism, and excretion. PK applications allow for the safety and effective therapeutic management of drugs. PD is the study of the biochemical, physiologic, and molecular effects of a drug on the body. It involves receptor binding, post receptor effects, and chemical interaction. PG is the study of...
the role of the genome in drug response. It analyzes how the genetic makeup of a patient could affect their response to drugs. PG involves correlating gene expression with PK and PD.

Certain genes and their normally-occurring variants called Single Nucleotide Polymorphisms (SNPs, pronounced “snips”) produce the enzymes that govern how drugs are distributed in the body, metabolized, and excreted. A genomic test that identifies those genes and their variants in a sample, such as a drop of blood, from a particular patient provides insight into how that patient will process a particular drug. The proposed genomic testing will include not only genetics, which is the identification of particular genes and their SNPs but also epigenetic testing, which is the identification of genes normally turned off that may be turned on, and vice versa, as a result of environmental factors. A genomic assay is part of CCHMC’s NeoRelief system and is expected to be part of the system being developed for adolescents.

Since adolescents are concerned with the prospect of pain before and after surgery, the CCHMC system also includes other tests designed to measure tolerance for pain and responsiveness to non-opioid methods of controlling pain, such as cognitive behavioral therapy and methods that affect pain pathways. CCHMC current has a non-drug treatment program called ADAPT, Aim to Decrease Anxiety and Pain Treatment, which is a web-based behavioral intervention program used in children with abdominal pain. For this proposal, they plan to modify and test it in their population of postoperative adolescents.

Thus, the proposal is to couple the genomic testing with an adaptation of the ADAPT program. During the interview, the applicants strongly stated that genomic testing and ADAPT program were coupled. After the interview, the Review Team received communication indicating the potential for decoupling.

This project is expected to take two years. Applicant has applied for additional grants from the National Institute of Drug Abuse that will complement the work under this project. The proposal envisions additional studies at the end of this project to establish efficacy in other populations, efficacy in other kinds of electronic health records, and cost-effectiveness.

This is not a field empty of potential competitors. The proposal cites four companies that offer in vitro diagnostic products related to the work under this project: Assurex Health, Quest Diagnostics, Kailos Genetics, and Proove BioSciences. The last, Proove, was recently liquidated after becoming the target of a criminal probe regarding dubious scientific and business practices.

Use of Funds: The project plan has 3 major milestones: The project deliverables are expected to be:

1) To develop a risk stratification system for predicting drug tolerance, chronic postsurgical pain, drug abuse tendency and respiratory depression from opioids. (OTF funds: $213,276.44)

2) To develop and test an advanced electronic health record (EHR) linked decision support platform for individualized opioid dosing and choice of non-opioid drugs based on genomics of pain pathways involved. This will integrate demographic and diagnostic data, psychosocial and dosing histories, PK/PD and PG data, in a pharmacostatistical model. (OTF funds: $110,443.35)

3) To develop and test epigenetically modifiable, web-based behavioral therapy modules for parents and children for significant improvement in pain coping, reduction in postoperative opioid use and CPSP development. (OTF funds: $76,280.73)

Strengths of Proposal:

This project is innovative in that it is used for individualizing opioid dosing for adolescents but also involves psychosocial aspects of the patient. Currently, there are no opioid dosing platforms available that would
include specific patient demographics, PG, PK, and PD. The applicants are also studying chronic postoperative pain and risk of tolerance, which are contributing factors to addiction.

The NeoRelief platform for genomic testing has already achieved technical proof of concept. In addition, CCHMC has a proven basis for successful genomic testing development, as their technology is the foundation for AssureRx’s business (personalized dosing based upon genetic testing for mental health medications).

To date, eight patent applications have been filed, with a mix of methods, algorithms, treatment claims utilizing biomarkers.

**Concerns with the Proposal:** Concerns include Team, Path to Market, Time to Market, Technical Maturity, Scientific Soundness, Impact, Commercial Capability and Project Resources.

Currently, the Team is all researchers, with no commercialization or business acumen. This lack of commercialization focus is evident in the grant proposal which reads like a research proposal with few commercialization details provided. The Path to Market is not defined, including how ADAPT could be replicated outside CCHMC. Clinical utility and cost effectiveness will have to be demonstrated for the genetic testing described for a reimbursement strategy. There are several competitors in the genetic testing market, several of which are targeting pain mitigation. Recent developments with Proove, cited above, may make attracting investment capital more difficult and create a higher burden of proof, all of which will slow adoption.

The projected Time to Market is 5+ years, with 2 years allocated for dosing and refinement of the ADAPT program, and 3 years for clinical work and to bring the products to market. Once the plan for this grant is complete, the applicants plan to test algorithms in other populations and perform cost analysis studies.

While genomic testing is a proven technology, and the testing has been proven with neonates, the proposal indicates that the team will be testing the hypothesis that pre-operative targeted, risk-based behavioral therapy directed towards adolescents will improve pain outcomes. Testing hypotheses is fundamental research.

In the interview, when queried regarding an example of an ADAPT technique; the response was watching videos to divert attention from pain. The Review Team believes that involvement of a commercial team at an earlier date would have helped the applicants form a more cohesive and compelling value proposition.

The initial impacted population is a narrow subset, albeit potentially critical population, that would likely be adolescents in CCHMC undergoing highly invasive surgeries.

Funds beyond the grant study phase have not been identified and communicated in this proposal.

**Recommendations:** Due to the above identified concerns, this proposal is not recommended for Program funding.
**Proposal:** TECG20180028

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**Lead Applicant:** Wright State University

**REAL TIME ASSESSMENT OF DIALOGUE IN MOTIVATIONAL INTERVIEWING (ReadMI)**

### Impact

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<tr>
<th>Impact Importance</th>
<th>Solution Importance</th>
<th>Solution Uniqueness</th>
<th>Market Pull</th>
<th>Time to Market</th>
<th>Tech Maturity</th>
<th>Scientific Soundness</th>
<th>IP</th>
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### Technical Readiness

### Commercial Readiness

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<tr>
<th>Existing Investment</th>
<th>Team</th>
<th>Project Resources</th>
<th>Path to Market</th>
<th>Commercial Capabilities</th>
<th>Market Barriers</th>
<th>Financial Stability</th>
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**Technology:** An element of the national effort to combat drug abuse, including alcohol and opioids, is Screening, Brief Intervention, and Referral to Treatment (SBIRT), a protocol for caregivers in the field, promoted by the national Substance Abuse and Mental Health Services Administration (SAMHSA). SBIRT is said to markedly reduce drug abuse and misuse, so there is a motivation to train more workers in the field. At-risk patients undergo the brief intervention through an approach known as motivational interviewing (MI), which has been demonstrated to be effective in triggering change in these high-risk lifestyle behaviors. However, MI is under-utilized due to difficulties in training practitioners, it being counterintuitive to most professionals, and the cumbersome training/assessment. To combat the challenge of the cumbersome training/assessment, Wright State University has developed a computerized voice-recognition system that detects how well a trainee in mock or real interviews is applying the precepts of SBIRT.

Under SBIRT precepts, the interviewer during an MI should:

- Employ open-ended questions, that is, questions whose answers require the client to give a full answer, not just a yes or no.
- Avoid closed-end questions.
- Make reflective comments, that is, make responses to things the client has said reflect what was said, thus encouraging the client to amplify their responses to questions from the interviewer.
- Use and encourage the client to use “emotion” words, that is, words that reflect emotion, such as “afraid”, and “happy.”
- Keep the interview going, with the client doing most of the talking.
- Make use of a “change ruler,” that is, inviting clients to commit themselves to change their drug-abusive habits by employing a scale, 0-10 with 0 indicating no commitment at all and 10 indicating a commitment to change today.

The applicants have developed a computerized, voice-recognition system called Real-time Assessment of Dialogue in Motivational Interviewing (ReadMI), which can parse speech and reliably recognize open-ended questions, closed-ended questions, reflective responses, use of emotion words, the time that the interviewer and the client each are speaking, and use of a numerical ruler during a brief interview. Having recognized these features of an interview, the system scores the interviewer’s performance by returning the number of times the interviewer used the first four precepts, the length of time that the interview lasted and Quantum Commerce, LLC
the proportion of time that the interviewer and the client were each speaking. Rather than waiting weeks
for a transcript and evaluation as happens in conventional training, the ReadMI will provide virtual
instantaneous, constructive feedback to a trainee.

Use of Funds: The project plan has 3 major milestones:

1) Finalize development of a software based MI training tool with speech recognition software that
    provides metrics on the number of open ended and closed ended questions asked, provider vs. client
    conversation time, number of reflective statements, number of emotion words and use of change
    rulers, with 95% accuracy
2) Compare MI training results for trainees who utilize the software based MI tool vs conventional
    MI training
3) Formulate and execute a go-to-market strategy for the tool.

Strengths of Proposal: The budget in the proposal requests $500,000 in OTF funds and proposes a cost-
share of $613,995, which will come from Wright State University, contributing almost $600,000 in cash.
The remainder is an in-kind contribution worth $20,000 from The Entrepreneurs Center (TEC). The team
anticipates having a product ready to market in 2 years. The existing version of the software is nearly
complete, and will streamline training processes significantly. This will create opportunities to sell the
software both to companies which conduct robust in-person MI as well as to vendors in the continuing
education space.

Concerns with the Proposal: Concerns include Impact, Solution Importance, Commercial Pathway, and
IP. The crux of the proposal is to provide real time, immediate feedback on Motivational Interviewing
which is taught as continuing education for physicians and other healthcare professionals. The applicants
state Real MI as the only automated MI training assessment system, but there are other training systems
available. These systems are arguably deficient in various ways as compared to ReadMI, but the applicants
have not conducted market research to understand what their customers need nor what would drive
preference for this tool over others.

One of the goals of the project is to assess trainees using the technology for feedback in MI vs those
receiving conventional feedback. But there is no goal to use the tool in real situations such as an emergency
room and ascertain if those who had feedback with the tool have a higher success rate than those who were
conventionally trained. Further, the applicants conflate the utility of MI, generally, with the utility of this
tool, specifically, as relates to the opioid crisis. Thus, the impact of MI on opiate issues was not well-defined
in the grant, or the interview.

The projected addressable market in the grant appears to be overstated. The grant proposal projects the
market based upon the number of Continuing Education Classes taken by physicians, but the addressable
market is the number of classes taken in Motivational Interviewing, which is a small subset of the number
of Continuing Education classes. In addition, focusing on medical students and training centers where
SBIRT is currently being taught will not cause an appreciable impact to the opioid crisis. If there is an
appreciable impact it would be extremely difficult to measure and would take a significant amount of time
to ripple out through the medical community. The team is pursuing patents and copyright protection, but
neither is currently in place.

Recommendations: Due to the above identified concerns, this proposal is not recommended for Program
funding.

Quantum Commerce, LLC
Technology: Two of the major root causes of the opioid crisis are legitimate users who become addicted and diversion which is misappropriated drugs from legitimate users. 65% of non-medical users of opioids obtain them via diversion. The proposed solution addresses both of these root causes. iMed MD, LLC, proposes further development, leading to FDA approval, of a secure, medication-dispensing system for drugs that are legitimately prescribed but subject to diversion and abuse.

Replacing conventional practices, iMed MD proposes, for drugs subject to abuse and diversion, a new system involving communication over the Internet and a locked, tamper-resistant, remotely-controllable, GPS-locatable device that contains the drug and dispenses it only in response to a signal sent from a remote computer. Supporting use of the device is a software platform called Acuity, operated by the applicant.

In practice, when a physician writes a paper prescription for a drug subject to abuse, he or she also enters the prescribing information online (patient name, drug, and dosing information into Acuity.) When the patient presents the paper prescription at a pharmacy, the pharmacist accesses Acuity and verifies the identity of the patient and adds the biometric marker, such as a fingerprint. The pharmacist fills the prescription and places it in the device, which is then locked and given to the patient.

Subsequently, the device dispenses pills according to the prescribed regimen in response to signals sent over a wireless or wired connection to the Internet in the patient’s home. The device contains a reader so that only the patient (or caretakers) with his or her unique biometric marker can cause a pill to be dispensed. Signals from the device to Acuity allow the prescribing physician to monitor the patient’s adherence to the desired schedule. A wireless connection to a mobile phone allows the patient to report efficacy of the medication in relieving pain. The GPS locator in the device allows tracking if the device is lost or stolen. The Acuity system flags and records unauthorized attempts to dispense the medication. In addition, the Acuity software can aggregate de-identified data to reveal prescribing habits and local trends in use of opioid drugs.

The applicants have fully defined the features of the product and constructed a working prototype. They applied for a patent in January 2017. They expect to have FDA 510 (k) approval before the end of the two-year project.
Use of Funds: The plan in this proposal is to develop the device and the Acuity software with the communication system, to seek FDA approval as a Class II device, and to enter the market. This will be accomplished with the following 5 milestones:

1) Design, revise, and finish iMed MD and Acuity software device development with the target of 99.9% dispensing accuracy;
2) Carry out FDA-required usability and 60601 testing on Prototype 2.0;
3) Establish FDA-required Quality Management System;
4) Obtain FDA 510k medical device approval for commercialization; and
5) Establish supply chain and sales channel readiness to support market entry and initial sales.

Strengths of Proposal: This device could impact the opioid crisis in two ways: 1) ensuring that pain medications are taken only as directed, and 2) reducing or eliminating diversion to non-prescribed individuals. The key is biometric scanning, which replicates what is done in hospitals all over the country to control medications by personnel.

As there is nothing on the market with the target capabilities, the solution is unique, although there are devices with some aspects of the solution. There is definite market pull from pain management prescribers who desire to be responsible in balancing the need to prescribe opioids with the concern with diversion or misuse. Physicians are concerned with opioid abuse and want to monitor medication adherence.

The commercial path to market visualized by the company is to market first to hospital-based pain clinics and pharmacies, mainly in Ohio, which is a sound strategy because there are only a few dozen of them and they account for about half of all pain patients.

In addition, it is relatively close to market, with expected market entry in 2 years.

Concerns with the Proposal: The most significant concern relates to Market Barriers. The applicant was unaware of the current regulations regarding return of drugs, specifically opioids. The FDA does allow for drop off kiosks, but the nation’s largest pharmacy chain has as a corporate policy to not accept drug returns. Walgreens does have kiosks for returns, but only at approximately 300 stores. However, there is no provision for recycle of the container due to the concern for diversion. Any opioid return must be destroyed. The model proposed by the company was due to cost, the bottles would be cleaned and recycled.

Concerns which were not sufficient to preclude funding relate to Team, Technical Maturity, Project Resources, Path to Market, Commercial Capability.

The Team lacks business leadership experience. The team consists of: a medical device salesperson; a software engineer; an electrical engineer; and two consultants: a pain specialist and a regulatory specialist.

The lack of business leadership was manifested in multiple dimensions in the review. Examples include:

1) Lack of awareness of pharmacy policies and FDA recommendations regarding return of unused opioids. Pharmacies do not generally accept returns of opioids and the FDA recommends returning unused opioids on scheduled ‘take back days’ or flushing those medications down the toilet. Either way this will create challenges for this device.
2) No clear logistical pathway for the return and cleaning of the device for re-use
3) No value proposition as to why a patient would want to have their medicine restricted or how to prevent the patient from saving pills for later use

4) There is also a question of payment for use of the system. The proposal mentions a Medicaid program, two Veterans’ Affairs programs, and CMS (Center for Medicare and Medicaid Services) as having or expected to have programs that would pay for a medication management system, but there is no indication of discussion with private insurers who cover a major portion of the US population.

5) The team provided multiple answers as to the projected cost of the container

As the plan currently stands, the system when developed will handle 5 pill configurations and sizes, but there are considerably more in the opioid space when different manufacturers, different concentrations, different release timing etc. are put into the equation.

There is a clear-cut integration challenge. In order for the system to be usable, all components of the system – the Acuity software and interfaces for prescribing physicians and dispensing pharmacists must be in place. The devices themselves must be built and placed in pharmacies to be available as needed. This will not be a trivial task.

**Recommendations:** Despite the ingenuity of the device, the commercialization is fundamentally flawed, and the proposal is not recommended for Program funding.
Proposal: TECG20180012

Lead Applicant: Think Scientific Innovations, LLC

PRELAPSE: A MULTI-FACETED INTELLIGENT ALERTING SYSTEM TO PREVENT RELAPSE IN PATIENTS WITH OPIOID ADDICTION

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Amount Requested: $ 858,000

Recommended: $0

Impact | Technical Readiness
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Impact | Solution Importance | Solution Uniqueness | Market Pull | Time to Market | Tech Maturity | Scientific Soundness | IP

Commercial Readiness

| Existing Investment | Team | Project Resources | Path to Market | Commercial Capabilities | Market Barriers | Financial Stability |
--- | --- | --- | --- | --- | --- | ---

Technology: Public health programs to assist opioid addicts in recovery are a major part of the country’s efforts to stem the opioid crisis, but the nature of addiction is such that the relapse rate is high: 56% of addicts coming from recovery programs relapse in the first week, and 91% relapse in the first year. Achieving long-term sobriety usually requires multiple initiations and relapses. PreLAPSE, developed by Think Scientific Innovations, is a technological response to this situation. It employs the recent technical innovations that underlie smartphones, remote computing, and the Internet of Things (IoT - a network of generally simple devices embedded with network connectivity, which enables these objects to collect and exchange data over the Internet). In addition, the proposed solution would combine physiological data such as oxygen levels, pulse, temperature, respiration, and sleep with lifestyle monitoring.

PreLAPSE, is composed of: 1) a wrist-wearable physiological monitor and interface for personal inputs to be worn by addicted patients who have completed a recovery program; 2) a cloud-based computerized record of data from the monitor, accessible by designated caregivers; and 3) an analytical software program that predicts likelihood of relapse into addiction on the basis of the monitor’s data and, when needed, alerts appropriate persons of the condition.

Use of Funds: The plan is based upon four major milestones:

1) Merge and optimize PreLAPSE design components into a single integrated technology platform
2) Execute PreLAPSE usability study amongst 100 patients released from rehabilitation facility based out of clinics
3) Refine PreLAPSE design and functionality based on data/results and end user feedback obtained during product usability study
4) Generate a business plan for PreLAPSE, seek commercial partners, acquire additional capital required for initial market entry

Strengths of Proposal: The principals have developed a wearable device for monitoring personnel in space confined areas. The primary benefit of this monitor is as an overdose alert system. Respiratory arrest can be detected, and emergency personnel can be automatically alerted to an overdose situation without any human intervention. If the device is charged and connected to a cell phone, first responders can auto-locate the victim and provide potentially life-saving care.
**Concerns with the Proposal:** The primary concern which precludes funding is the lack of the fundamental proof of concept for opioids. During the interview, it was apparent that little to no effort had been expended for opioids. The plan is a research proposal to re-purpose a wearable device for use in monitoring the health status of individuals working in hazardous confined space areas. While there are proven elements of physiological monitoring, none of them have been proven in opiates, and the only technical connection made to date is sleep patterns. Applicants have not yet built the necessary algorithms to predict relapse potential. Even when built these algorithms will require significant user input. If users do not provide input, or if the device is not charged and worn during sleep, the applicants do not yet know whether the algorithms will function properly.

Additional concerns which alone were not sufficient to preclude funding include Time to Market, Project Resources, Path to Market, IP, and Market Barriers.

Since the development is early, there is no Intellectual Property protection, but the applicants say that they expect to submit two or three patent applications for the wearable monitor and for the system as a whole.

The projected time to market, at 5 years, is at the far end of Program expectations.

The team has no opioid expert or recovering addict, and the members of the Review Team who are in recovery or who work with addicts see significant user friction with being “tethered to a safety person”. Sobriety ultimately occurs from within the addict and having someone over-watching is potentially disconcerting. There is also potential user friction and liability concerns in the escalation to physicians and emergency response personnel.

The financing to commercialization is tight, with no cash backstop. In addition, there is no reimbursement strategy and the Path to Market was a regurgitation of data, not a commercialization strategy.

**Recommendations:** Due to lacking the Proof of Concept and additional concerns cited, the proposal is not recommended for Program funding.
Technology: One of the major consequences of opioid addiction occurs in the infants born to mothers who are addicted. These innocent babies often have Neonatal Abstinence Syndrome (NAS) and are forced to experience withdrawal in the early days of the life. Mu Therapeutics proposes further development of 6-beta-naltrexol (6BN), a metabolite of the drug 6-beta-naltrexone, an opioid antagonist, for us in pregnant, opioid-addicted women to alleviate the possibility that their babies will be born with NAS.

NAS describes a condition in neonates whose mothers have used various drugs during pregnancy, including prescription and illicit opioids, drugs that treat addiction like methadone and buprenorphine, some antidepressants, alcohol, and tobacco. The active ingredients in these substances cross the placenta to enter the fetus’s bloodstream, where the active ingredients can then travel to the brain. In effect, the babies are born with an addiction. After birth, the neonates no longer receive the substances to which they are addicted and consequently suffer the effects of withdrawal. These effects are similar to those felt by adult users, however in the case of neonates in particular, the effects reveal themselves as mottling of the skin, diarrhea, excessive crying, fever, and slow weight gain. The standard treatment is to administer morphine or methadone in tapering doses, but these treatments do not prevent longer-term effects such as cognitive deficits.

The applicant discovered that a) even in the absence of an opioid agonist, opioid receptors in the brain have a basal signaling activity; b) this basal signaling is enhanced in opioid-dependent patients; and c) conventional opioid antagonists such as naloxone (Narcan) and naltrexone (Vivitrol) act as “inverse agonists” in these patients. They not only antagonize the opioid agonist but also suppress the basal signaling activity in the opioid receptors. This suppression is believed to be the reason for the extreme potency of conventional opioid antagonists, which cause instant withdrawal symptoms in opioid-dependent patients. Applicant also discovered that there are drugs that were “neutral opioid antagonists” that bind to the receptor sites and block the effect of opioids, but do not suppress the spontaneous signaling activity of the receptors. One of these compounds is 6-beta-natrexol. Six-beta-naltrexol (6BN) is the major metabolite of 6-beta-naltrexone (Vivitrol), which has FDA approval and is widely used as an opioid antagonist to prevent relapse in addicted patients in recovery.

The current proposal plans to develop an oral formulation of 6BN because it is a neutral opioid antagonist with a special property: when given in small doses to a pregnant, opioid-addicted woman, it does not enter the mother’s brain and cause withdrawal symptoms because of the blood-brain barrier (BBB), but it does

Quantum Commerce, LLC
enter an fetus’s brain because of its immature BBB, where it acts as an antagonist to the opioid but does not suppress basal signaling, whose suppression is thought to be the cause of withdrawal symptoms. 6BN therefore presents the potential of being an effective way to treat addicted mothers so that their neonates do not suffer with NAS.

**Use of Funds:** The goal of the project is to submit an IND within the project timeline. The Project Plan is to build on previous in vivo pharmacology and validate the hypothesis in a guinea pig model (similar in physiology to human placenta and fetal development). In addition, the plan includes adding to existing in vitro and in vivo toxicology studies.

Specifically, the major initiatives include:

1) Determine the pharmacokinetics of 6BN in the pregnant guinea pig, fetus, and newborn.
2) Develop a treatment strategy to suppress fetal opioid dependence in the guinea pig model, and perform pre-IND toxicology studies
3) Perform preclinical 6BN toxicology studies in dogs and rats
4) Completion of final toxicology studies and IND Submission
5) Initiation of Phase I/II Clinical Trial

**Strengths of Proposal:** There is no other management that can prevent the onset of NAS for neonates born to mothers with exposure to opioids, so this is a first-in-class treatment strategy to focus on treatment and prevention of NAS. In terms of numbers, NAS is relatively small subset in the opioid problem, but the fact that it affects innocent neonates elevates its importance, and the fact that 6BN has the promise of being a cure, not a palliative, reinforces the impotence.

The technical hypothesis is sound as Naltrexone is already approved for use in pregnancy; 6BN is the main metabolite of naltrexone.

**Concerns with the Proposal:** The concern which precludes funding is the project is too early in the development process. The technology is pre-IND (a requirement of OOAPTTI) and there is no human study data. The Phase 1 and 2 trials for Proof of Concept in humans are not scheduled or planned until 2020. Administration of the 6BN treatment is targeted for the third trimester of pregnancy, which should address the NAS withdrawal symptoms in newborns. What is not known at this point is whether premature birth and the associated costs and complications will also be addressed.

The proposal itself does not indicate how long it will take before the product comes to market. Post-interview, the team provided additional information indicating a mid-case time frame for launch in 2022 which would involve accelerated approval and also the potential for a post approval study.

The proposal indicates it will be necessary to raise $40-50 million to support getting the product through all of the clinical trials.

**Recommendations:** Due to lacking the Proof of Concept and the lengthy time to market, the proposal is not recommended for Program funding.
Technology: Patients on legitimately prescribed opioid can still face the challenge of discontinuation discomfort. The applicants propose development of an online self-administered step-down protocol, in conjunction with suite of adjunct alternative therapies (non-opioid) and assistance provided by a team of healthcare providers (physician, pharmacist, counselor, etc.)

Applicants draw upon the distinction between addiction and dependence with respect to opioid neurobiology. This distinction is not always easy to ascertain, but in essence the body can become dependent upon the drug before the brain becomes addicted to it. The NIH/ National Institute on Drug Abuse defines Addiction as compulsive drug use despite harmful consequences and is characterized by an inability to stop using a drug. They define Physical Dependence as body adaptation to the drug, requiring more of it to achieve a certain effect (tolerance) and eliciting drug-specific physical or mental symptoms if drug use is abruptly ceased (withdrawal). Physical dependence can happen even if opioids are taken as instructed. This secondary condition of withdrawal symptoms is the target of the technology.

The applicants indicate that, of all the patients who have been prescribed opioids, only a small percentage become addicted, while the remainder only become dependent and could, with proper intervention, be relieved of taking opioid drugs.

The step-down program, called the Butterfly Protocol, aims to provide pharmaceutical support (such as substitution of non-addictive drugs), physical support (such as osteopathic manipulation, physical therapy, and use of neuromodulation devices), and psychological support (from multiple caregivers), all through an online portal for patients taking opioids but wish to discontinue use.

Use of Funds:
The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. IT Bid Solicitation: Recruit and onboard IT Partner.
2. User Requirements Development: Requirements elaboration, Interface design document, Ergonomic constraints, Search Engine Optimization [SEO], Social Media Interface, OORS interface specifications, etc.
4. User Documentation Development: The design, elaboration, review and production of all relevant end-user documentation.
5. Step-Down Team Training: 2 weeks of intensive training for six Step-Down Team members.
6. IEP Materials Development: Development of all multimedia materials required in order to meet the requirements for an effective Information & Education Program.
7. Promotional Campaign Development & Launch: Develop of all components required in order to successfully launch a broad-spectrum campaign driving The Butterfly Protocol™ directly into the minds of patients, practitioners and the public-at-large.
8. IEP Community Launch: Launch of the Information & Education Platform to the general public.
10. PMI Software Evaluation [Alpha]: Test Case development and deployment extending over the entire range of User Profiles. Evaluation, extraction and redesign requirements for each test case scenario.
11. PMI System Test [Beta]: Advanced Test Case development and intensive deployment extending over the entire range of User Profiles. Evaluation, extrapolation of redesign requirements for each test case scenario. Iterative cycle.
12. PMI Pilot Launch [Phase I go LIVE]: Deployment of the Chrysalis™ PMI and availability of use in the day-to-day operations of The Butterfly Protocol™ across all User Profiles.

**Strengths of Proposal:** The intent of the proposal aligns with the project objectives. The ability to reduce opioid dependence prior to addiction is a noble goal. Giving opioid patients options for step down treatment with a team of healthcare providers should be of value to end users once the technology is further developed and deployed.

**Concerns with the Proposal:** The Review Team found significant concerns related to Technology Maturity, Existing Investments, Team, IP, Path to Market, Commercial Capabilities, and Market Barriers Mitigation. The proposal has a lack of evidence of efficacy for the technology, which was also not adequately described. Commercial efforts are lacking as it appears that it has neither been built nor tested. The size of the existing
investment is minor compared to the proposal’s budgeted needs. The team only consists of a non-profit organization with a technical collaborator. The Lead Applicant biographical information contains no specifics that would engender confidence in project execution. Nearly all the requested funding is to be utilized external to the applicant, further raising concerns about the team qualifications and is contrary to the intent of the program. IP has not yet been developed. In addition, the collaborator is to retain its own IP. The proposed commercial Path to Market was not addressed beyond generalized assertions of team abilities, and notably lacked integration and reimbursement strategies. Applicants lack Commercial Capabilities, as the lead applicant is a non-profit and there has been no team expertise defined, nor a commercial partner identified, to carry the technology forward. Market Barriers remain significant without efficacy data or a reimbursement strategy.

Additional concerns which were not alone sufficient to preclude funding relate to Scientific Soundness, Uniqueness, Project Resources, Market Pull, and Financial Stability. The technology is in use; however sufficient details were lacking in order to evaluate the Scientific Soundness. Although it appears to be a holistic approach in nature, details provided indicate that this is only an incremental improvement to the opioid crisis. Project Resources are insufficient, as cost share seems to be based upon future sales and not cash in hand. Further, the budget table contains errors. Market Pull will be hindered by significant user resistance. As a result, significant marketing efforts will be required to promote a proof point that does not yet exist. There appears to be a lot of ancillary backing; however, none of it is on the lead applicant.

**Recommendations:** Due to the above identified concerns, this proposal is not recommended for Program funding.
Proposal: TECG20180008  Lead Applicant: NeuroTherapia, Inc.  NTRX-07, A NOVEL, NON-OPIOID THERAPY FOR PREVENTION OF CHRONIC NEUROPATHIC PAIN

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### Impact

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### Technical Readiness

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#### Technology: Applicants have completed pre-clinical testing of a novel, non-opioid drug (NTRX-07) that is a novel small molecule inflammation modulator that decreases inflammation in the Central Nervous System (CNS) that can be associated with development of neuropathy (nerve pain). The applicant proposes clinical trials, with healthy volunteers to establish safety and suitable dosing (Phase I trial). Pre-clinical trials have established that the drug is both safe and efficacious in an animal model.

Chronic nerve pain can result from prolonged period of ischemia (insufficient blood supply) to a region of the body causing nerve damage and consequent chronic pain. Diabetics often suffer from the condition, especially in their feet due to limited blood supply. Other causes can be anti-cancer drugs or nerve injury. Opioids are commonly prescribed for nerve pain. NTRX-07 is a novel approach to neuropathic pain through its anti-inflammatory property in the CNS. It readily passes through the blood-brain barrier and is an agonist (stimulator) to the cannabinoid type 2 receptor (CB2). It has been shown to promote neuronal survival by decreasing pro-inflammatory microglial activity. Microglia, immune cells in the central nervous system, promote an inflammatory response that is sign of neurological disorders, including chronic pain. They act as macrophage cells, the main form of active immune defense in the CNS.

#### Use of Funds: The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. Development & Initiation: Engagement of Contract Research Organization (CRO); Finalization of Protocol; Development of case report forms and electronic data capture system; Recruitment of volunteers
2. Patient Enrollment – Single Ascending Dosing (SAD): Screening volunteers; Dosing volunteers; Data collection; Analysis of pharmacokinetic samples
3. Database Lock – SAD: Final data entry; Audit of data collection
4. Final Report – SAD: lysis of data; Preparation and review of data tables; Preparation and review of final study report
5. Patient Enrollment – Multiple Ascending Dosing (MAD): Screening volunteers; Dosing volunteers; Data collection; Analysis of pharmacokinetic samples
6. Database Lock – MAD: Final data entry; Audit of data collection
7. Final Report – MAD: lysis of data; Preparation and review of data tables; Preparation and review of final study report

Strengths of Proposal: The applicants have attracted significant funding to their cause, having raised $4MM in grants and equity. The intent of the proposal aligns with the Program objectives. Developing non-opioid replacement medications is important for reducing the Opioid Crisis. The applicants have presented a strong team to lead the technology forward. The IP has been appropriately protected. The applicants and collaborators have sufficient Commercial Capabilities. There will be a strong Market Pull should the technology be proven successful.

Concerns with the Proposal: The Review Team found significant concerns related to Scientific Soundness and Time to Market. The project objectives are not related to the efficacy of the drug with respect to the opioid crisis, but only safety/tolerability studies of an Alzheimer treatment candidate. The Program intent is that requested funding support opioid relevant objectives. The applicants indicate that the Time to Market exceeds eight years.

Additional concerns which were not alone sufficient to preclude funding relate to Technology Maturity, Uniqueness, Project Resources, Path to Market, Market Barriers, and Financial Stability. Although the technology has preclinical evidence, and meets the program criteria for IND, it is still very early on the Technology Maturity curve. The technology is incremental to improvement of the opioid crisis by applying to a subset of users and is in an already crowded market space. There is no overt opioid support as Project Resources are emanating from an Alzheimer’s Foundation grant money to study the technology for other purposes. The Path to Market may be confounded by a potential gap in funding at Phase II clinical efforts, and further by the competitive landscape being undefined.

Recommendations: Due to the above identified concerns, this proposal is not recommended for Program funding.
Proposal: TECG20180009
Lead Applicant: IVA Biolabs

Real-time Wearable Sensor to Detect Opioid Overdose and Misuse

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**Technical Readiness**

**Commercial Readiness**

**Technology**: The applicants propose to develop a wearable technology, similar to a smart watch or health monitor, that would track when an opiate user’s blood oxygen saturation or heart rate drops to a clinically relevant level that indicates a life-threatening condition. Upon said detection it would then send an alert to a caregiver via a paired cell phone.

Initial development would be to build the device as a health fitness product. At a later unspecified time, (post FDA approval as a medical device) the wearable monitoring appliance would be given to everyone for whom a prescription for an opioid is written. The device would continuously monitor heart rate and blood oxygen level, both of which decline markedly in cases of drug overdose. If an overdose is detected, the device would send a signal to designated persons, such as family members or friends and to emergency response personnel. The device would also provide real-time information, such as patient location, and other treatment data previously entered.

**Use of Funds**: The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. Hardware Development: Complete the development of the wearable device, including testing in a laboratory setting
2. Software Development: Complete the software development
3. Device Manufacture: Manufacture the finalized wearable device for field testing
4. Field Testing: Conduct a field test in collaboration with pain management physicians
5. Patent Filing: Update, file and convert the provisional applications to US and PCT Applications
6. Administration: Project Management

**Strengths of Proposal**: The intent of the proposal aligns with the Program objectives. The ability to intervene in overdose conditions is important for the opioid crisis.

**Concerns with the Proposal**: The Review Team found significant concerns related to Existing Investment, Uniqueness, Team, Project Resources, IP, Path to Market.
Commercial Capabilities, Market Pull, Market Barriers, and Financial Stability. Although there may be some merit in the concept of continually monitoring the behavior of people prescribed opioid drugs, the proposal has neglected consideration of practical matters concerned with adoption of the technology. There is minor Existing Investment directly in this technology. The proposed technology is not Unique as it already exists. The Team lacks members with sufficient business acumen and regulatory expertise, and were non-responsive to inquiries regarding the proposal. The need for the proposed clinical trial is indeterminate, as the regulatory pathway has not been established. Project Resources are significantly lacking as the collaboration partner withdrew from the project and the applicant doesn’t have matching cost share. With the collaborator withdrawing from the project, the use of their contributed IP is highly unlikely. The Path to Market is confounded by a lack of reimbursement strategy and privacy related user resistance. Further, the Market Size has been significantly miscalculated on the up side, by identifying prescription count as opposed to end users. Commercial Capabilities are lacking as a result of the above Team deficiency and collaborator departure. Market Pull has not been demonstrated. Indeed, the Review Team can only see a market opportunity if the court system mandates use. There are significant Market Barriers, as insurance entities would be very resistant to selling a unit with every prescription, end user resistance would be high, and the technology provides minimal utility without the ability to detect misuse or abuse by the patient. The lead applicant does not have the financial resources to execute the project, and by inference, lacks the Financial Stability to bring the technology to market.

Additional concerns which were not alone sufficient to preclude funding relate to Technology Maturity, Science Soundness, and Time to Market. Part of the technology (the hardware) exists, but the software portion was to be developed with the project by the collaborator that has exited the team. This encumbers the applicant’s ability to execute on those objectives. The components of the technology are Scientifically Sound; however, the suitability of the system as a whole is uncertain. The applicants are uncertain of the regulatory pathway and timeline to market.

**Recommendations:** Due to the above identified concerns, this proposal is not recommended for Program funding.
Proposal: TECG20180015  
Lead Applicant: ChromoCare Holdings, LLC  
CHROMALERT™ / OOAPTT

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**Technology:** Applicants propose the development of a predictive software algorithm tool to integrate into an existing commercial genetic test of efficacy for personalized medicine in opioids prescription. The plan is to utilize the existing genetic test (GAP) and combine with patient data into an algorithm (ChromRX) to get a resultant score on recommended prescription and addiction potential (ChromAlert). A future enhancement of the software capability with machine learning is intended (ChromAI).

ChromAlert by Chromocare, is an enhancement of an existing technology. The GAP Test (Genetic Assisted Prescribing) has been available for commercial use by healthcare providers since 2015. It uses genetic information to analyze metabolism, drug-compatibility, and interaction potential. The applicant proposes use of software to enhance the Gap Test, allowing healthcare providers to make more informed opioid prescribing decisions based on environmental and genetic factors, and calculated risk of addiction.

The GAP Test is an existing pharmacogenetic test (effect of genetic factors on drugs). It analyzes the genes producing the liver enzymes involved in metabolism of medications (over 350 compounds, including opioids). This analysis would assist clinicians prior to prescribing pain medication to allow for minimizing the use of addictive opioids by a patient at risk for toxicity/addiction. Further, it would provide information allowing prescribers to choose the correct drug at the correct dose.

ChromAlert, an enhancement of the GAP Test, is a disease predictive genetic test created to evaluate an individual’s potential for developing addiction. It analyzes a subset of genes shown to be predictive in developing addiction. It then applies an algorithm used to establish a genetic risk assessment variable (risk of addiction), to assist healthcare providers with choosing an opioid or in monitoring an opioid treatment plan.

ChromRX is a reporting system database accepting genotype data and phenotype data, to recommend an appropriate drug and dose.
ChromAI Engine is an artificial intelligence engine designed to assimilate the data from the GAP Test, ChromAlert, toxicology, opiate risk assessments, and clinical observation to identify complex patterns associated with addiction. Thus, creating a risk assessment score to prevent addiction.

Use of Funds: The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. Add and Assign Resources: Begin to hire Project Manager, Fiscal Agent, Project Support, Product Manager and Marketing Manager, Etc.
2. Prepare ChromLAB Network™ for processing: Confirm adherence to Pre-analytic SOPs at primary lab for the handling of accessions with the combined test type of ChromALERT™, The G.A.P Test™ and Toxicology.
3. Integrate ChromALERT™ into ChromRx™: ChromRx™ system development to include the addition of ChromALERT™ call data along with toxicology results in order to generate a report accessible via by healthcare providers.
4. Finalize patient report design and format for distribution: Work with designer to produce ChromALERT™, The G.A.P Test™ and Toxicology results into a format prepared to deliver through portal.
6. Prepare Kit inventory: Order and prepare kit inventory for distribution along with Education and Marketing Materials.
7. Data-points and methodology: Gather a team of healthcare experts in Ohio from OSU, Cleveland Clinic, and other established authorities in the fields of psychology, genetics, and clinical practice to evaluate results and optimize ChromALERT™ Assay as a comprehensive risk assessment tool for predicting the disease of addiction.
8. Begin testing new and existing patients – goal 500: Launch ChromALERT™ across Ohio. Enroll healthcare providers to test 500 patients complaining of acute or chronic pain and either starting an opiate prescription or currently receiving an opiate as part of their treatment plan.
9. ChromAI™ Scope and Development: In accordance with the criteria identified during phase (7 above), and the existing ChromALERT™ specifications, begin to Scope the development of the ChromAI Engine™ to receive genotype, phenotype, and metabolite data points.
10. ChromAI Engine™ development, testing and analysis: Load all existing data and begin to apply logic and algorithms to optimize the ChromALERT™ risk assessment score and outline hypotheses for testing in the Retrospective Review.
11. Refine ChromALERT™: Review data and optimize algorithms for application to the Assay. Identify and make any needed adjustments to the ChromALERT™ genetic test.
12. Prepare ChromLAB Network™: Validate the ChromALERT™ Assay across ChromLAB Network™ ordering reagents and human DNA specimens from
Coriell Biosciences and using Open Array standard operating procedures for genetic testing and analysis on Quant Studio or Agena Mass Array equipment.

13. Define Retrospective Review: Define parameters, regions and target market for review, prepare marketing plan on how to meet criteria.

14. Prepare for Retrospective: Review Marketing campaign for enrollment and then distribution of kits. Prepare all study materials including surveys, communication of reports, collection of data. Design and produce all materials related to the execution and administration of the Retrospective Review. Materials include notification of the Review and qualifications for enrollment, patient information and collection materials.

15. Launch successful Retrospective Review with ChromAI™ integration and development of ChromRx™: Launch retrospective review across Ohio by registering healthcare providers, distributing sample collection materials, processing samples in ChromLAB Network™, collection of data and final analysis report to be used to optimize the ChromALERT™ risk assessment tool.

16. Evaluate and identify best practices and patterns to optimize products: Gather a team of healthcare experts in Ohio from OSU, Cleveland Clinic, and other established authorities in the fields of psychology, genetics and clinical practice to evaluate results and optimize ChromALERT™ Assay as a comprehensive risk assessment tool for predicting the disease of addiction.

17. Further Integrate ChromAI™ functionality with ChromRX™: Once the ChromAI™ functionality is complete, integrate it into the ChromRx™ database for reporting and integration with ChromLAB Network™. Data feed and robust reporting structure for access by healthcare providers and patients.

18. Report development and Patient Support: Portal access developed out of the ChromRx™ platform for consolidated reports ChromALERT™, The G.A.P Test™ and Toxicology. Dynamic references for each patient’s current treatment program.

**Strengths of Proposal:** The applicants have a substantial investment of $2MM in the GAP test to date. The intent of the proposal aligns with the Program objectives. Prediction and prevention risk assessment of opioid addiction would be extremely beneficial in the opioid crisis. The applicant intends to partner with the BWC for further evaluation. If the technology proves successful, it would be a game changer for the Opioid Crisis. Time to Market is expected to be a relatively short period of 24 months.

**Concerns with the Proposal:** The Review Team found significant concerns related to Team, Project Resources, IP, Commercial Capabilities, Market Pull, Market Barriers, and Financial Stability. The existing project Team is insufficient in number and commercial capability to fully achieve the proposed objectives. Program funding would be used to substantially increase the size of the company, but largely in support functions unrelated to development of the technology. Hiring a full new staff, and integrating them into a team with the expectations of project completion within 2 years is overly ambitious and incongruous with the intent of the Program. Without committed cost share, the Project Resources are inadequate. Further, the vast project budget exceeds all past fund-raising
efforts. As such, the ability to attract sufficient capital is uncertain. The IP is only trade secret as it exists, and filing for protection is intended as a future activity once the system is completed. Expectations were that some patent protection should have already occurred on at least the existing GAP test. Commercial Capabilities are insufficient with respect to the lead applicant’s management team. The CEO’s background indicates that he did not complete his business education, and the listed experience was as chief revenue officer for a telemedicine company that ceased operations after 4 years and liquidated (Chapter 7). The COO’s background includes a 9-year gap and seemingly no technologically relevant management expertise outside of ChromoCare. With the information given, it is unclear how the management team will drive this technology to market. Market Pull is significantly hindered by a lack of reimbursement strategy. Patients will be unwilling to pay out of pocket and practitioners will be highly resistant to utilize the technology if they cannot get compensated for applying it. A complicated plan, $9.4MM funding needs, a lack of IP, and no reimbursement path all present unresolved Market Barriers. The Financial Stability of the applicant is unknown. They have identified a prior private investment of $1.3MM, but state they have no project collaborators’ or letters of commitment - even though they expect 4 companies to support 80% of the $4.7MM project cost share. Additional concerns which were not alone sufficient to preclude funding relate to Technology Maturity, Scientific Soundness, and Path to Market. Although the assay product exists, the predictive portion of the Technology does not. The Scientific Soundness of the whole system is yet to be determined. Without a clinical trial to validate the risk score, the Path to Market is encumbered by a lack of physician reimbursement for data entry.

Recommendations: Due to the above identified concerns, this proposal is not recommended for Program funding.
**Proposal:**
TECG20180016

**Lead Applicant:**
Rx Directory Online LLC

**OPIOID OVERDOSE AND DEPENDENCE MEDICATION LOCATOR SERVICE**

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**Technical Readiness**

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**Technology:** Applicant proposes to build an opioid treatment drug inventory query database and website, to help patients locate the nearest in stock pharmacy supply, if they have exhausted their at home medications.

The applicant’s plan is to develop an inventory reporting software and displaying website by repurposing an existing application program interface (API) that would allow patients to locate pharmacies that have inventory of specific drugs used to treat opioid dependence or overdose. They state that one barrier to opioid dependence treatment could be that patients are sometimes unable to get the needed medication at the pharmacy due to lack of inventory from back orders or order delays. These patients need their medication in a timely manner, because delays in receiving the treatment medications could result in relapse or treatment failure.

They will develop a database where pharmacies, directly or via a corporate server, provide inventory data on a specific set of drugs. These medications will include buprenorphine, buprenorphine/ naloxone (Suboxone), methadone, and naltrexone (Narcan). A website will be developed allowing patients access to the inventory information in the above-mentioned database. The patients using the website would need a prescription filled for their opioid dependency treatment or obtaining naltrexone for overdose. This website would provide a quick tool to help the patients find a pharmacy of convenient location with the needed medication and a map of the pharmacy’s location.

**Use of Funds:** The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. Branding for website: Create an effective brand and strategy for the website
2. Secure URL for website: Website will have a registered domain
3. Database modification: Medication inventory database will be modified for only the aforementioned medications
4. API modification: API will be modified for only the aforementioned medications
5. Website Creation: Website will be created utilizing brand guidelines
6. Integrate into pharmacy systems: We will integrate our website to allow reporting of inventory levels from pharmacies.

7. Launch of website and advertisement to patients: Website will be launched, and we will begin informing patients of the new tool.

**Strengths of Proposal:** The Intellectual Property has been protected with a patent filing. The Time to Market is expected to be a short period of 1 year.

**Concerns with the Proposal:** The Review Team found significant concerns related to Impact, Scientific Soundness, Solution Importance, Path to Market, Commercial Capabilities, Market Pull, and Market Barriers. The Review Team considers the Impact of this technology on the opioid crisis to be minimal. No data was provided to indicate that the problem being solved is creating angst in the target market. The Scientific Soundness cannot be properly evaluated as the problem being solved is indeterminate. The Solution has relatively low Importance to the overall problem. No data was provided to support a stock out of treatment medication at the nearest local pharmacy primarily leading to street drug procurement by the patient. The Path to Market is insufficient. No business model was presented as to revenue or payors. Applicant has not negotiated with pharmaceutical chains for adoption interest, and should expect significant resistance to sharing business sensitive inventory data. Given the stated market objectives, the lead applicant lacks Commercialization Capabilities to drive the product to market. Market Pull appears to be nonexistent as the market problem was not defined and end customers were not consulted. Opioid treatment patients are typically frequent visitors of the pharmacy already. Further, due to the utilization of electronic inventory management, stock outs are uncommon. Market Barriers are significant. The proposed option of direct to individual pharmacies is not realistic. Independents are nearly extinct and local branches of pharmacy chains have no authority to share inventory individually. Further these are regulatory ‘controlled substances’ and have additional barriers for dispensing. This includes a legally limited barrier of a single/one-time controlled drug prescription transfer between pharmacies. The lack of a revenue model is daunting. Direct patient subscription to the service is unlikely due to the financial stress of addiction consequences.

Additional concerns which were not alone sufficient to preclude funding relate to Technology Maturity, Existing Investments, Uniqueness, Team, Project Resources, and Financial Stability. Evidence of Technology Maturity is lacking, as the predicate for repurpose appears to be incomplete. The extent of Existing Investments was not delineated. However, at least some investment would have been required to patent the API and for development efforts on the predicate product. The product has Unique features, but the impact to the opioid crisis is minimal. The Team appears to have the qualifications to do the project, but only if assuming the predicate product has been developed. The collaborator has sufficient resources to execute the project objectives. However, the lead applicant as a one-person entity has unknown bandwidth towards project provisioning. The Financial Stability of the lead applicant is unknown. The collaborator appears to be a stable entity.
**Recommendations:** Due to the above identified concerns, this proposal is not recommended for Program funding.
Technology: The applicant proposes to repurpose (upgrade, test, and evaluate) an existing medication-dispensing technology (iRxReminder) intended for use by patients in their homes. The technology consists of a tamper-resistant container for pills, a smartphone app, and a cloud-based control module. This apparatus is programmed to notify the patient when it is time to take the medication. It dispenses only the prescribed dose and only during a prescribed window of time, keeping a record of accesses to the pod, and providing this information to designated health professionals overseeing the patient's care.

The iRxReminder Medication Monitoring platform, is a medication tracking and dispensing system consisting of a pill dispensing device (PDD)(pods), the iRxReminder smart device app, and the cloud-based iRxControl Center. The system (app and pod) is designed to make medication schedules effortless by dispensing the proper dose at the proper time for a patient. It was designed to encourage compliance to taking medications on a preset schedule and for a subset of the pediatric patient population. It tangentially has the potential for reducing overuse/misuse/diversion. The iRxControl Center is used by healthcare providers to program medication schedules and monitor adherence.

Use of Funds: The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. Management team for project: Personnel managing regulatory and manufacturing activities for the project period.
2. Update iRxReminder PCB and firmware: Complete design enhancements and pre-manufacturing activities in preparation for FDA clearance testing and manufacturing
3. Update iRxReminder mechanical tooling: Complete design enhancements and pre-manufacturing activities including existing and new mold development in support of preparation for FDA clearance testing and opioid distribution requirements.
4. Manufacture and assemble iRxReminder electronic components: Incorporate design enhancements into a PCB run for 1000 units.
5. Manufacture and assemble iRxReminder pods: corporate design enhancements into a parts run for 1000 units.
6. Complete UL FDA regulatory mechanical and electronics tests: Complete tests for FDA clearance.
7. Finalize FDA clearance submission: Prepare application for FDA clearance.
8. Submit for FDA clearance: Submit FDA clearance application
9. Management team for commercialization demonstration project: Assemble and train project management team for demonstration projects in the four use cases described.
10. Finalize ACH protocols and project personnel: Write clinical protocol and recruit project personnel.
11. Submit for IRB approval: Submit full level-III IRB application.
13. Train hospital personnel and implementation and integration review: Clinical protocol training of contracted personnel and co-investigators (e.g., physicians).
14. Conduct commercialization demonstration project recruiting, monitoring, and disposal: Enroll 200 patients in the four use cases described for the process study.
15. Complete data analysis: All data entered, analyzed.
16. Complete state reporting: Required OTF reporting completed.
17. Expand commercialization: Implement broader marketing and sales projects.

Strengths of Proposal: The technology intended for repurposing already exists and is in use in academia. The applicant has raised nearly $1MM to date and has cost share in hand. They have assembled a talented team to drive the technology forward. The hardware Intellectual Property has been appropriately protected with multiple patents.

Concerns with the Proposal: The Review Team found significant concerns related to Scientific Soundness and Market Barriers. The proposal is not Scientifically Sound with respect to the opioid crisis. It has in fact not been repurposed to opioids but is simply a continuation of the extant technology development path. The methodology described encourages compliance with specified medicinal schedules. As such, it would encourage taking pain medication, even if the patient was not experiencing symptoms at the designated time. There was no attempt to identify or address Barriers for opioid market adoption. Further, FDA clearance and commercial use has yet to materialize for the technology after a number of years in development, implying market adoption friction.

Additional concerns which were not alone sufficient to preclude funding relate to Impact, Solution Importance, Uniqueness, Path to Market, Market Pull, Financial Stability. The Impact on the opioid crisis is minimal at best. It could marginally slow down consumption, but program participation appears more as an afterthought than a fully developed solution for opioids. The Solution Importance could have some impact on addiction treatment compliance, but is minor for pain management. The solution is not Unique as competition exists and this represents an incremental improvement in opioid over-consumption. The Path to Market is obscured as they will have a saleable product, but it is not tailored to opioids. Opioid market analysis was not presented in the proposal to indicate Market Pull,
if any. Financial Stability is tentative, as they have plans to raise a Series A, but no commitments.

**Recommendations:** Due to the above identified concerns, this proposal is not recommended for Program funding.
**Proposal:**
TECG20180019

**Lead Applicant:**
Hope Research Institute

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**Commercial Readiness**

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**Technology:** The applicant proposes an aggressive plan consisting of three large divergent sub projects: education and training of primary care providers (PCP), involving telemedicine Addiction Specialist; using pharmacogenetics testing to measure addiction susceptibility through the PCP; and development of a low cost self-injector medical device to manage overdose that also links to a facility to offer assessment and treatment.

It appears that no telemedicine device exists, but is to be developed during the project. Once created, it would connect the PCP with the subcontracted Ohio Employee Health Partnership and lead applicant to deliver live assistance on proper treatment of addicted patients. The pharmacogenetics test is undefined in the application, nor are there any related development objectives. The vast majority of the funding request would be utilized for de novo development and manufacture of 10,000 units of the injector device. The injector is intended to be Internet of Things (IoT) enabled, with the intent of connecting users to unspecified treatment options. [IoT refers to a network of generally simple devices embedded with network connectivity, which enables these objects to collect and exchange data over the Internet.]

**Use of Funds:** The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. Hire/contract operational team: Hire management team - Technology Manager/Engineer, Product Manager, Biometrics Engineer
2. Marketing Plan: Marketing firm – contract with firm development market potential/strategy
3. Provider Development: Provider Relationship/Network plan development
4. Hire/contract product manufacturing/design: Contract with manufacturing engineering firm to complete design, manufacturing process and evaluate potential manufacturers
5. Validate approve execution plan: Validate designs (device and software), marketing and provider engagement Patent submission
6. Hire/contract software development: Technology Manager and Product manager execute plans and staffing software development staff to complete device
communication protocol, treatment and telemedicine applications (cloud and mobile)

7. Prototype – device and software approval: Device – final prototype testing and production plans
8. Treatment plan approval: Validate treatment plan implementation via telemedicine application (cloud and mobile)
9. Government approval and clinical trials: FDA submission State
10. Manufacturing of device for market acceptance [sic]: 10,000 units – setup and manufacturing, distribution
11. Treatment counseling/support hiring and training: Social/RN/MDs
12. Marketing Roll-out: Advertisement/marketing [sic]
13. Effectiveness study: Monitor and access viability
14. Commercial [sic] viability: Develop plan

**Strengths of Proposal:** The intent of the proposal aligns with the Program objectives. Education efforts and predictive risk assessment of opioid addiction would be beneficial to the opioid crisis once developed.

**Concerns with the Proposal:** The Review Team found significant concerns related to Technology Maturity, Existing Investments, Scientific Soundness, Project Resources, IP, Path to Market, Commercial Capability, Market Pull, Market Barriers, and Financial Stability. Any one of the sub projects would be challenging on its own. Combining them in one project under this Program seems untenable. The Technology is only conceptual at this time. The active compound for the autoinjector was not defined, nor were the logistics of how an overdosed, and potentially compromised, patient would be capable of self-administering the device. There is no reference provided to any Investments into this specific technology. The Scientific Soundness is unknown because the outcomes have not been proven. Project Resources are insufficient given the project complexity, and the magnitude of the cost share shortfall and a lack of cash commitment from any collaborators. The listed objectives and budget table only tally to the funds requested from the State ($8MM), implying that no cost share would be utilized in the project plan. IP does not exist, and they will need to avoid extant IP from competing devices. The Path to Market was undefined. The applicants will need to design a product de novo with an unspecified active that will cost 10% of current device while still being Internet of Things enabled. This seems an unrealistic objective by itself and is only portion of the overall project. The lead applicant is one person (an MD with no business expertise) and as such lacks the Commercial Capability to bring this technology to market. Even with all the media attention surrounding opioid crisis and ability to purchase naloxone at a reasonable price, without requiring a prescription in Ohio, Market Pull remains minimal for retail purchase of naloxone by patients, family, or caregivers. Although, the availability of an auto-injector might be convenient for the community at large, it is not necessary for first responders, and would have little end impact on the opioid crisis. No attempt was made to describe current Market Barriers or anticipated challenges. Financial Stability is
unknown, however given that the applicant has requested 100% of listed project costs be covered by OTF funding, it would appear that their resources are insufficient.

Additional concerns which were not alone sufficient to preclude funding relate to Impact, Uniqueness, Team, and Time to Market. The written proposal ostensibly aligns with the program intent, but the technology doesn’t exist. The idea of a 90% lower priced Narcan delivery device would be Uniquely impactful. However, the proposal does not provide a path to achieve that objective. The Team consists of the one-member lead applicant and two listed from the collaborator (subcontractor). It is indeterminate if the indicated team’s talents align with the needs of the project. The indicated timeline is only 24 months. However, the poorly specified plan and lack of resources makes achieving the project objectives unlikely in such a short time.

Recommendations: Due to the above identified concerns, this proposal is not recommended for Program funding.
Proposal: TECG20180030  
Lead Applicant: The Cleveland Clinic Foundation

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Amount Requested: $2,000,000  
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<th>Time to Market</th>
<th>Tech Maturity</th>
<th>Scientific Soundness</th>
<th>IP</th>
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Technology: The applicants propose to combine existing technologies from Cleveland Clinic and Cardinal Health into an integrated system for pain treatment. They call it PRIME for “Prescribe, Receive, Inform, Monitor, and Engage.” The system is intended to reduce opioid prescriptions when alternative treatments are warranted and to monitor adherence to prescribed regimens.

These goals would be accomplished using a web based ‘platform’ to inform patients and healthcare providers during the pain treatment cycle. Platform tools would also aid in monitoring, detection of risk, intervention, and provision of behavioral therapy. This would require involvement of prescribers, pharmacists, and payors. Clinicians would input patient psychosocial information and the platform would support them in prescribing suitable therapies, including non-opioid options as appropriate. The platform would employ tools to educate patients on stress reduction, engage them with pharmacist interactions, and monitor at-risk patient usage of opioids through 3rd party adherence solutions. Physicians would engage and monitor patients’ usage patterns through a dashboard with the intent of early intervention if necessary.

Use of Funds: The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. Project Kickoff: Complete Pre-work: Project Kickoff, Detailed Planning, Solution Architecture
2. Base Platform Dev: Enhance & repurpose existing tech platform for opioid interventions with existing users
3. Platform Services: Integrate cognitive-behavioral therapy or coaching services into the base platform
4. Physician Integration: Integrate physician offerings to the base platform
5. 3rd Party Integration: This phase will define [sic] 3rd party integration (services and products) to the base platform
6. NewCo Creation: Forming of NewCo, in-licensing of technology; Commercialization [sic] scale-up of the solution to prepare for Month 25 Commercial Launch
7. Pilot Alpha: Complete Solution Pilot Alpha (1 customer)
8. Pilot Beta: Complete Solution Pilot Beta (2-3 customers)

**Strengths of Proposal:** The Cleveland Clinic and Cardinal Health are both formidable organizations with significant financial and technical resources and extensive experience in commercializing technologies. A treatment lifecycle approach has merit in addressing the opioid crisis.

**Concerns with the Proposal:** The Review Team found significant concerns related to Technology Maturity, Scientific Soundness, Path to Market, and Market Pull. There has been no testing of the combined Technology system to determine if it works as intended. Further, since the proposal is lacking in evidence of efficacy of the previously developed technologies, the Review Team is unable to infer efficacy of final product. There are no objective results or plan to show the Scientific Soundness for pain, nor are there any metrics for a successful outcome of planned activities. Path to Market faces significant resistance to adoption by payors, patients, and practitioners. Market Pull is unknown, as there has been no real-world market research.

Additional concerns which were not alone sufficient to preclude funding relate to Existing Investments, Impact, Solution Importance, Uniqueness, IP, Time to Market, and Market Barriers. Component parts have seen Investment, but none for the system as a whole. An integrated solution aligns with the intent of the program; however, since efficacy has yet to be shown, the Impact is unknown. The Solution Importance of using these alternative pain management methods was not shown. Utilization of the combined system would only be incremental to solving the opioid crisis. Trade Secrets provide minimal IP protection. Development challenges may impact the Start Up company’s ability to achieve market entry. Economic and broader Market Barriers to adoption will increase beyond internal utilization by the lead applicant and its partners.

**Recommendations:** Due to the above identified concerns, this proposal is not recommended for Program funding.
Technology: The applicant proposes an aggressive plan consisting of five large divergent sub projects. The intent is to develop a health technology suite for the integration of patient data, from Dayton regional hospitals, regarding overdoses (OD), OD deaths, justice system records, and drug treatment services. They will then analyze the data for an understanding of the effectiveness of different approaches for pain management and avoiding opioid use. Four Dayton companies: Ascend Innovations (Lead Applicant), Real Art, Mile Two and Cognovi labs, will work with the University of Dayton (for community outreach) to develop and launch the suite.

Each of the companies will develop a piece of the suite -

1. **Pain Management Interface**: Mile Two proposes development of a pain management app for use by physicians, which will take information from existing electronic health records about drugs administered or prescribed for individual patients and display in graphical form the aggregate level of analgesia produced by the drugs at any given time. Patients will also enter qualitative pain scores into the app, to allow for correlation of drug regimens with perceived pain impacts.

2. **Immersive Neurosensory Therapy**: Real Art will further develop a VR (virtual reality) system coupled with a means for identifying brain activity, such as electroencephalography (EEG), to recognize what elements in the VR imagery stimulate centers in the brain known to be involved in opioid drug addiction, a technique called Immersive Neurosensory Therapy. This is intended to provide a new means for countering addiction without substituting a drug.

3. **Social Media Insights**: Cognovi Labs will use information taken from social media platforms such as Facebook and Instagram (with permission of the patient) to learn more about a patient’s mental health and to monitor patients in recovery from addiction. Cognovi states their underlying proprietary technology can extract meaningful, accurate insights from natural text.

4. **VYE - Eye Movement Tracking**: Ascend Innovations proposes repurposing an already developed, eye-movement app called VYE to assist in detecting concussions, which the company believes can be modified to serve as a means to
detect opioid use. They expect that the device will be used by employers to determine that rehabilitated addicts, whom they employ, are “fit for duty.”

5. **Data Analytics:** Overarching the above efforts, Ascend Innovations will also develop a cloud-stored data base that aggregates information from patients’ electronic health records, justice department records, and records from drug treatment centers to provide a more comprehensive view of a patient’s status. Applicant hopes to query these results for insights into the mechanisms that have created the opioid crisis.

The objective of the above work is to analyze the at-risk population for how addiction successfully transitions to recovery and further identifying individualized treatments to reduce the relapse rate.

**Use of Funds:** The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. Concept Development: Define requirements, specifications, and overall concept
2. Prototype Version 1: Iterate through design and development of first prototype
3. Prototype Version 2: Iterate through design and development of second prototype
4. Final Prototype Version: Make final refinements to create final prototype version
5. Field Test & Evaluation: Insert technology into appropriate use case (physician) for test & evaluation

**Strengths of Proposal:**
The various founding investors and collaborators of the applicant are all stable, well-resourced organizations capable of supporting this endeavor. Some elements of the proposal present novel and potentially innovative approaches to dealing with the opioid crisis. The collective power of these four companies and their skill sets could create a unique and powerful solution.

**Concerns with the Proposal:** The Review Team found significant concerns related to Technology Maturity, Existing Investments, Scientific Soundness, Path to Market, Market Pull, and Market Barriers. Some of the Technology exists, but the remainder is only conceptual. As a system, the technologies are disjointed and were not developed as a suite, nor for opioids specifically. Existing Investments have been for the individual components for other uses. No discrete investment exists for the combination system. The impact of the system is unknown, and the combination lacks Scientific Soundness as it does not offer clear proof of concept which would demonstrate the ability to solve any problem clearly defined by the proposal. The speculative nature of the research, with unknown efficacy, combined with complex and disjointed product offerings that have unexplained synergy and which are to be managed across five entities seems untenable. Market Pull is undefined and seems too complicated to evaluate as a unified offering. If any part of the system is not efficacious there is no way to determine the potential impact on the entire offering. Market Barriers are not addressed by the proposal. For example, how would this system displace existing solutions?
Additional concerns which were not alone sufficient to preclude funding relate to Impact, Solution Importance, Uniqueness, Team, Project Resources, IP, Commercial Capability, and Time to Market. Impact is limited because of the complexity of the combined system from separate entities. Solution Importance is impacted by a lack of cohesiveness in solving the problem. The system may provide only an incremental solution to the opioid crisis. Team participants are qualified individually, but bringing the solution together as a whole system appears to be a significant challenge. Project Resources mixes cash in hand with projected future revenue as source of matching funds. Copyrights and Trade Secrets provide minimal IP protection. The combined solution will be difficult to Commercialize together. The two-year timeline is optimal, but again will be challenged by the overall complexity of the proposal.

**Recommendations:** Due to the above identified concerns, this proposal is not recommended for Program funding.
Proposal: TECG20180034 | Lead Applicant: Cleveland Clinic Foundation
---|---
Total Budget | Cost Share
$1,448,000 | $724,000
Amount Requested: $724,000 | Recommended: $0

**Technology:** The applicant seeks to develop a neurostimulation device that can be affixed to nerves near the ribs at the end of a thoracic surgical procedure to reduce the use of post-operative opioids.

This neurostimulation electrode design can be positioned and fixed over the intercostal nerves (nerves between ribs) before the end of a thoracic surgery. The neurostimulation device will create a local nerve block, improving postoperative pain after thoracic surgery (lung, esophagus, chest wall, cardiac). Post-surgical pain following thoracic surgery is known to be severe and sometimes to impede recovery from the surgical assault. During the time the chest cavity is open, the intercostal nerves are easily accessible. Applicant proposes to take advantage of this intra-surgical opportunity to provide electrical nerve stimulation, which has been found effective at suppressing the sensation of pain, and thus supplant the opioids that are commonly prescribed to treat pain in these patients. The electrodes would be removed before the patients are discharged home from the hospital.

**Use of Funds:** The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. Feasibility system technical file: Produce engineering specifications and bench test results to support IDE application
2. IDE approval: Obtain FDA approval to complete clinical study under IDE
3. IRB approval: Obtain Cleveland Clinic IRB approval to complete clinical study
4. Complete clinical study: Enroll and complete testing on 10 subjects
5. ThoraStim™ stimulator design: Produce engineering specifications and bench test results to support future Pivotal Study IDE application

**Strengths of Proposal:** The intent of the project is well aligned with the intent of the program, by replacing opioids with neurostimulation for pain control. The Cleveland Clinic is a formidable organization with significant financial and technical resources and extensive experience in commercializing technologies. The Intellectual Property (IP) protection includes a pending utility application and a pending PCT application. If the
technology proves successful, there is expected to be a good Market Pull in the thoracic surgical population.

**Concerns with the Proposal:** The Review Team found significant concerns related to Technology Maturity and Path to Market. The Technology is nascent versus expectations and competitive progress. One of the components (the implantable lead) exists, but the testing will be completed with off the shelf parts as opposed to it being a completely developed system. The bulk of the project will be to design the pulse generator for future use. Path to Market is compounded by the lack of an existing New Company to take the technology to market. This absence of a commercialization entity will undoubtedly raise the risks to the timeline and increase funding concerns. The system efficacy is also unknown and thus clouds the market path. The applicants do not state the anticipated duration of pain mitigation effects, which may result in a delayed, but inevitable, opioid prescription after discharge from the hospital.

Additional concerns which were not alone sufficient to preclude funding relate to Existing Investments, Impact, Solution Importance, Uniqueness, Team, Time to Market, and Market Barriers. Existing Investment has been minor, versus the overall funding necessary to get to market. The proposal is aligned with the program generally, however, as it applies only to in-patient care, the overall Impact is reduced. The Solution Importance is lower as it only applies to a smaller subset of the opioid use population. The overall technology is not Unique as alternative electrostimulation products exist. However, the application during surgery is unique. Team participation is lower than Program intent as the majority of the requested funds will be spent with a third party with offices in Minnesota and California. Stated Time to Market is four years. However, the lack of an extant NewCo, pulse generator and integrated system development, and future fund-raising needs combine to create uncertainty on timelines. The above-mentioned Market Barriers will present a challenging pathway.

**Recommendations:** Due to the above identified concerns, this proposal is not recommended for Program funding.
<table>
<thead>
<tr>
<th>Proposal: TECG20180042</th>
<th>Lead Applicant: Plitzie LLC</th>
<th><strong>Analytics &amp; Informatics Training: Public Health &amp; First Responders Partnership</strong></th>
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<tr>
<td>Total Budget $217,200</td>
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<tr>
<td>Amount Requested: $150,000</td>
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<td><strong>Technical Readiness</strong></td>
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<td><strong>Scientific Soundness</strong></td>
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<td><strong>Commercial Capabilities</strong></td>
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<tr>
<th>Commercial Readiness</th>
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<tr>
<td><strong>Existing Investment</strong></td>
<td><strong>Team</strong></td>
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<tr>
<td><strong>Project Resources</strong></td>
<td><strong>Path to Market</strong></td>
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<tr>
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<td><strong>Market Barriers</strong></td>
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<td><strong>Financial Stability</strong></td>
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**Technology:**

The applicant proposes to provide a technology to law enforcement/first responder (LEFR) that would provide up-to-date training, best practices, news, and identification of local resources. The intent is to create a dynamic training and live updated intelligence tool that intakes a variety and large number of sources of unstructured data to create trends and analytics for determining what works and what does not in combating the opioid crisis.

Interfaces would be both web-based and a mobile application. Content would include training media, news feeds, area resources and alerts, and would allow for customized content based on user selections. The technology would provide LEFR with training materials for dealing with drug users and abusers, and with information about local resources available to assist in their treatment. These materials and information feeds would be continually kept up-to-date by repurposing applicant’s existing AI algorithms.

**Use of Funds:** The project that the applicants intend to carry out with a grant from OTF has the following objectives:

1. **Resources Database:** Gather available opioid resources across state into a NoSQL database; annotated by type, eligibility, size and ZIP.
2. **Training Modules:** Survey and create training and protocols from LEFR and facilities into summary, response, onsite, overdose, recovery, follow-up, user profiles, local assets including module template building and teaching/design consultants
3. **Tool Repurposing:** Modify Plitzie LLC analytics tool to be usable for opioid database and analytics
4. **Database Entry System:** Create backend web services to provide an upgradeable API for interacting with an extensible data analytics engine
5. **App Dev:** Create web-based, platform-independent app for users to interact with the underlying data analytics API
6. App Bots: Extend backend web services with selection bots and frontend web app with familiar interaction gestures, such as swiping, to guide LEFR users to desired resources
7. Beta Testing: Deploy beta (app/website) to LEFR for feedback and modifications
8. Marketing & Sales for Market #1 Prep: Prepare and launch marketing and sales campaign for tool targeted to LEFR and support organizations
9. Investor Pitch: Lineup Gather contacts for Angel Investors across state and in areas heavily affected by epidemic, have pitch deck for next round of funding created
10. Marketing for Market #2 Prep: Approach and survey Market #2 targets (schools, hospitals and related orgs) for Version #2 product

Strengths of Proposal: Appropriate training and identification of available resources for opioid treatment are needed in our communities. Applicant identified Time to Market as a swift six months.

Concerns with the Proposal: The Review Team found significant concerns related to Technology Maturity, Existing Investments, Impact, Uniqueness, Project Resources, Path to Market, Market Pull, Market Barriers, and Financial Stability. The proposal did not disclose the specific user needs that would drive Technology development. No direct Investment has been made in this specific technology. The proposal does not disclose what the technology is nor its Impact on the opioid crisis. The technology is not Unique as it already exists and as a system doesn’t solve any identified issues. Project Resources are insufficient as there is too little money applied to successfully complete the objectives and this issue will be compounded by any problems that arise along the way. There is no business model describing the Path to Market. Therefore, project objectives, tool functionality, payor identification, and customer readiness cannot be evaluated. Market Pull is undefined. The need for better information is universal in nature and not descriptive of this market space specifically. Market Barriers such as contingencies, liability, continual development needs were not addressed. Applicants need more resources to fully get to market.

Additional concerns which were not alone sufficient to preclude funding relate to Scientific Soundness, Team, IP, and Commercial Capability. It is not clear how impactful this solution would be to the opioid crisis. How to ensure the Scientific Soundness/value of the information stream was not addressed. The Team PI has limited recent software experience. Trade Secrets provide limited IP protection. Commercial Capability is dependent upon the technology working properly.

Recommendations: Due to the above identified concerns, this proposal is not recommended for Program funding.
Final Summary

29 Proposals were submitted to the OOAPTTI Program, requesting $53.3MM in total funding. Of these, 27 were given an in-depth review with 16 of those advancing to the interview stage. From those, seven proposals are recommended for funding. The total recommended amount is $9.9MM, from the $12MM available.

Proposals which are recommended for funding are deemed to be near term impactful to the Opioid Crisis.
Appendix A - Corporate Background

Quantum Commerce, an Ohio Limited Liability Corporation, was founded in 2008 to provide consulting and services in the areas of quality, entrepreneurship, staffing, and advanced polymeric chemistry solutions. For almost a decade, the principals have been reviewing proposals, leading projects helping young entrepreneurial companies obtain financial sustainability or certifications such as ISO 9001, and providing advanced chemistry solutions for the construction services industry.

Quantum Commerce understands the unique needs and challenges startups. Quantum Commerce was founded by Camille Rechel and Greg Workman to provide business leadership, principally to young companies. Since inception, Quantum Commerce has generated profitability every year.

The principals are flexible in their methodology, yet structured by principles such as Six Sigma. In some cases, they operate as President and CEO (construction services provider), as contractors and business mentors (strategic business consulting), or as owner/Senior Executive (technical staffing/ placement). Quantum Commerce utilizes additional contractors or consultants as needed to supplement expertise.

The Principals of Quantum Commerce are Camille Rechel (CEO) and Greg Workman (President). They have teamed with Robert Worden for this project. This team is uniquely qualified to review the OOAPPTTI proposals because the principals have been responsible for prior OTF evaluations. For example: designing and executing the Technology Validation and Startup Fund (TVSF) evaluation process, as well as its evolutionary modifications to match program adjustments over the last six years. Collectively, they have designed and executed all the TVSF reviews to date including the scoring mechanism, the interviews, the reports and the presentations to the commissioners. This team was also responsible for Project Management and proposal reviews for the Technology Commercialization Center (TCC) Program.
Appendix B - Overview of methodology

The figure below provides the high-level summary. This method is analogous to the longstanding and proven processes we have used to evaluate proposals for other OTF programs. The Project Manager will receive the applicant proposals and distribute them to three 3 business reviewers. The reviewers will complete pre-defined down-select scorecards which are based upon the Opioid RFP requirements and include fourteen largely administrative criteria.

Those proposals that meet the quick selection scorecard criteria will pass on to the In-Depth review phase to be performed by all 7 reviewers (3 business and 4 technical experts). This review consists of twenty criteria in the areas of OOAPTTI program fit, crisis impact, scientific soundness, technological maturity, implementation feasibility, team and organizational business acumen, and financial robustness. The reviewers will formulate custom questions from these reviews. Those question sets will be forwarded to the applicants who will supply responses. The Review Team will evaluate those answers and formulate an expected RYG scorecard, with red indicating a high-level concern, yellow being moderate, and green being accepted. The team will then meet for a consensus on the RYG score to date.

As appropriate, those most meritorious proposals which are likely to garner funding recommendations will then proceed to the interview phase. Applicants that reach this phase will also have their proposal further reviewed by an individual with the ‘End User’ perspective, for ten specific criteria related to real world suitability at combating the Opioid Crisis, and integration/implementation feasibility. The interview will consist of an in-person team evaluation between the applicants and the evaluator (3 business reviewers and the Interventional Pain Clinician). The interview team will finalize the RYG scores.

The RYG is divided into three main categories: Crisis Impact, Technical Readiness, and Commercial Readiness. The main categories are further subdivided into a total of 15 more granular segments. Major concerns (Red) within a single segment does not necessarily require a full failure depending upon the extent of the concerns generated during the review process. However, if a full category becomes finalized as red based upon the significance of concern in one segment or resultant of the category segments in summation, then the proposal will not be recommended for funding.

Subsequent to the full review process, the Interview Team will make final determinations as to recommendations for funding based upon all relevant data analyzed to date, advise Development of the recommendations (in a Rank Order of highest recommendation first), and prepare the written detailed report and presentation for the commissioners.

After approval by the commissioners, the business reviewers will debrief the proposal applicants.
Appendix C - Evaluation Management Plan

**Project Manager:** The Project Manager will receive the proposals from the State of Ohio and distribute them along with the evaluation form to the Business Reviewers and the Subject Matter Experts (SMEs).

**Business Reviewers:** The Business reviewers will evaluate each proposal for the business aspects of the proposals based on the scorecard criteria above.

**SMEs:** Quantum Commerce augments the robustness of the reviews by utilizing a broad range of Subject Matter Experts. The SMEs included:

- PhD/MD who specializes in Drug Development
- DO who is certified in Pain Management and operates Pain Clinic
- PhD who specializes in Medical Device
- Pharmacist for major retail pharmacy
- Medical professional who is recovering addict

**Interviewers:** The majority of the technical input is achieved in the in-depth review of the grants and associated research. Therefore, the interviews are conducted by the business reviewers, and supplemented
by the Pain Management physician. Quantum Commerce believes the interviews should be conducted in a professional manner, conducted in a neutral location, and last approximately 1 hour.

**Report Writer/Editors:** Once all the interviews are complete, the Interview team meets to discuss each proposal. The Interview team then categorizes the applications according to recommended, not recommended or not eligible. Within each category, the grants are rank ordered by the interview team. Report Writers will provide to the Third Frontier Commissioners, a comprehensive report which will include the Red-Yellow-Green scoring for each proposal, as well as the rationale for the scoring. In addition, for each proposal, there is the team’s overall recommendation for funding. The Business Reviewers review the draft report for accuracy, clarity and quality.

**Presenter:** Robert Worden, one of the Business Reviewers, will present to the Third Frontier Commission a summary of the findings and recommendations for funding. He will also answer any questions the commissioners may have regarding the process or individual recommendations.

**Debriefers:** Business Reviewers Camille Rechel and Greg Workman will provide each proposal applicant the ability to be debriefed as to the negative findings regarding their proposal. It is the belief of Quantum Commerce that these debriefs could be critical as applicant companies continue development of their product to address the opioid crisis.

**Appendix D - Team Members’ Credentials**

**Gilbert Block (MD, PhD) – Pharmaceuticals/ Medical Technology**

Dr. Block earned both his PhD in Reproductive Biology/Neuroendocrinology and his MD from Case Western Reserve University. His lengthy career in neurology / neuropharmacology includes therapeutic expertise in translational neuroscience and all phases of drug development, and he has experience working with academic, foundation and NIH review committees, as well as venture capital companies. He has led clinical neuroscience groups at Astra Zeneca and Merck, among others. Additionally, he brings experience with fentanyl development programs as well as endeavors to develop non-abusable opiates. He will utilize his medical and pharmacological experience to evaluate the proposals from a development perspective.

**Robert Landfried (DO) – Medical Technology/ Diagnostics**

Dr. Landfried earned his DO from the University of New England College of Osteopathic Medicine. He is board certified in anesthesiology and pain management by the American Osteopathic Board of Anesthesiologists and has been practicing for more than 30 years. His primary focus is in interventional pain management, with experience in implant technology as well as opioid management and behavioral cognitive approaches. His training includes a fellowship in pain management at the University of Pittsburgh Pain Evaluation and Treatment Institute. He is a member, and past president, of the American Osteopathic College of Anesthesiologists (AOCA). Dr. Landfried serves as the Medical Director over Grove City Anesthesia & Pain Management at Grove City Medical Center. He will utilize his medical experience to evaluate the proposals from a clinical perspective, and was specifically selected to provide the osteopathic view as a balance to the traditional “MD” view.

**Phil Drew (PhD) - Medical Device/ Diagnostics/ Technology**

Dr. Drew earned his Ph.D. in Electrical Engineering from Harvard University, his M.S. in Applied Mathematics from Harvard University, and his B.S. in Mechanical Engineering from Carnegie-Mellon University. He has many years of experience in Medical Imaging, Health Care, and Hospital Operations at Mallinckrodt Institute of Radiology; Department of Radiology for the
State University of New York at Stony Brook; Cardiovascular Division of the Washington University School of Medicine; and Arthur D. Little, Inc. He provides strategic analysis planning services to medical imaging equipment manufacturers, hospitals, and radiologists. He also provides facility planning and organizational feasibility studies. He provides technological and market forecasts based on analysis of technical, clinical, operational and competition-related factors, for strategic product planning and acquisition studies. He will utilize engineering expertise to evaluate the proposals from a technical perspective.

**Amanda L Workman (PharmD) – Pharmaceuticals**
Dr. Workman earned her Doctorate of Pharmacy from the University of Kentucky. She has been a commercial Pharmacist for more than 15 years, with extensive experience dispensing opioids and other controlled substances to pain management patients in rural, urban, and suburban environments. She is Board Licensed in Ohio and Kentucky, with training in how to recognize problematic clientele that attempt to abuse the system to obtain opioids in excess of physician prescriptive guidance. She will utilize her pharmacological training and consumer interaction experience to evaluate the practical applications of proposed solutions to the opioid crisis.

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**End User**
Previous medical professional that is intimately familiar with the End-User perspective of Opioid addiction and recovery, both from personal experience and from helping others in recovery. Individual was an Emergency Room and Intensive Care Unit nurse for five years. Individual is a veteran of the United States Air Force with eight years in the Air Traffic Control Division. Individual was addicted to opiates for six years, and overdosed once while living in a major metropolitan US city. After which, returned to their home town (small city) to seek recovery. Started with IOP treatment and AA/NA meetings. After a few setbacks along the way, is now a recovering addict; celebrating seven years of sobriety. They continue to sponsor other addicts seeking treatment and recovery. Have reached more than 50 individuals to help them arrest their addiction and move forward with life in recovery. (*For the sake of privacy, the name of the end user reviewer is being withheld.*)

**Camille Rechel (Chemist) – Business Commercial Review**
Ms. Rechel has an American Chemical Society certified BS Chemistry from the University of Cincinnati, and she is CEO and co-owner of Quantum Commerce. She has over 25 years of Business Management experience, including building a business literally from a beaker to $50 million in sales as the Business Director. In addition, she has turned several businesses from years of having negative profitability to being highly successful businesses. She holds several pioneering patents for polymeric coatings for optical fibers. She brings experience from the chemical, food, medical device, pharmaceutical, recruiting and industrial electronics industries. Her core competencies include customer service, commercialization of new products, mentoring young companies and business development. She will utilize her business evaluation expertise to review the proposals for business merit. She is a past reviewer for the TVSF and TCC grants.

**Robert Worden (MBA) – Business Commercial Review/ Pharmaceuticals**
Prior to joining the Quantum Commerce team, Mr. Worden led a business development team at YourEncore for 9 years. In this role, he participated in or led the review team for TVSF and TCC proposals over several years. His consulting and business development background has exposed him to a wide variety of industries over a 20-year career, including life sciences, food and consumer, specialty chemicals and apparel. He is a certified Six Sigma Black Belt and earned his MBA from the Darden School at the University of Virginia. Robert currently works with people experiencing homelessness as a street outreach professional. He is on the front line of the opioid crisis, working to connect his clients battling addiction with treatment, counseling, housing options and medical care.

**Greg Workman (MBA, Chemist) – Business Commercial Review/ Pharmaceuticals**
Mr. Workman has a Master’s of Business Administration (MBA) from American Intercontinental University; an American Chemical Society certified BS Chemistry from Otterbein University; and is a
certified Six Sigma Black Belt, a Certified Quality Manager, and is President and co-owner of Quantum Commerce. He has more than 25 years of industrial leadership in a broad variety of industries including food, pharmaceuticals, and chemical manufacturing; electronics; logistics and construction services. He holds one chemical process patent. He leverages this expertise in business process design and improvements for companies ranging from start-ups to Fortune 500 firms. He has designed and implemented Management Systems and Manufacturing Processes for start-ups in the Biotech and Food industries. He will utilize his business evaluation expertise to review the proposals for business merit. He is a past reviewer for the TVSF and TCC grants.

Ellen Schoenfeld - Research and Proof Editor
Ellen Schoenfeld is a third-year medical student at Marian University College of Osteopathic Medicine. She earned a Bachelor's of Science in Health Sciences from the University of Cincinnati.