

**DO THE UNPRECEDENTED**

---

# Center for Health + Technology

---



UNIVERSITY *of* ROCHESTER

**CHE**T  
CENTER FOR HEALTH + TECHNOLOGY



**WHAT DRIVES US**

We want to enable **anyone**,  
**anywhere** to receive care and  
participate in research.

**OUR STORY**

130+

**CLINICAL  
STUDIES**

40,000+

**RESEARCH  
PARTICIPANTS**

7

**FDA  
APPROVALS**

The Center for Health + Technology is a research organization within the University of Rochester Medical Center that designs and conducts multi-center clinical research studies and uses technology to make unprecedented advances.

Over the last 2 decades, CHeT has re-shaped the conduct of clinical research and advanced knowledge to improve health for thousands, if not millions, of individuals.

CHeT has supported over 130 clinical studies, enrolled over 40,000 research participants, and conducted pivotal trials leading to 7 FDA-approved treatments.

CHeT collaborators span the globe and include leading academic institutions, pharmaceutical companies, technology firms, not-for-profit foundations, advocacy groups, and the federal government.

# 7 FDA Approvals

Over the last two decades, CHeT has supported clinical trials that have led to seven FDA-approved treatments. These include first of their kind therapies for Parkinson's disease, Huntington's disease, and other rare disorders.

## 2017 **Deutetrabenazine**

SPONSOR: Teva Pharmaceuticals

DISEASE: Huntington's disease

BRAND NAME: Austedo

## 2015 **Dichlorphenamide**

SPONSOR: Taro Pharma

DISEASE: Primary Hypokalemic & Primary Hyperkalemic Periodic Paralysis

BRAND NAME: Keveyis

## 2008 **Tetrabenazine**

SPONSOR: Prestwick Pharmaceuticals

DISEASE: Huntington's disease

BRAND NAME: Xenazine

## 2007 **Rotigotine**

SPONSOR: Schwarz Pharma

DISEASE: Parkinson's disease

BRAND NAME: Neupro

## 2006 **Rasagiline**

SPONSOR: Teva Pharmaceuticals

DISEASE: Parkinson's disease

BRAND NAME: Azilect

## 2003 **Entacapone**

SPONSOR: Orion Corporation

DISEASE: Parkinson's disease

BRAND NAME: Comtan

## 1997 **Pramipexole**

SPONSOR: Pharmacia & Upjohn

DISEASE: Parkinson's disease

BRAND NAME: Mirapex

# Achievements

Over the past 10 years, CHeT has been involved in over 20 studies utilizing novel technologies including wearable sensors, smartphone technology, and telemedicine including:

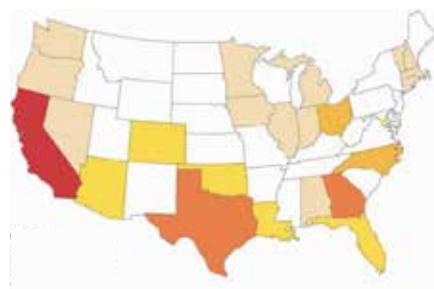
## 2011

1st national randomized controlled trial of telemedicine for Parkinson's disease



## 2012

1st virtual research study for Parkinson's disease



## 2014

1st virtual research study for Huntington's disease



mPower

## 2015

1st Apple ResearchKit app for a neurological disorder



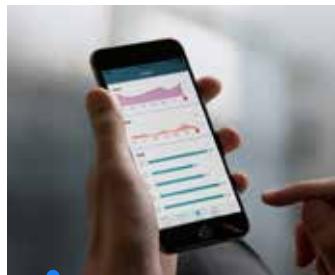
**COLLABORATORS**

MASSACHUSETTS  
GENERAL HOSPITAL



## 2016

1st to incorporate smartphone into a phase 3 clinical trial



## 2017

1st mobile app for Huntington's disease



## 2018

1st longitudinal  
wearable sensor study  
for Huntington's disease



## 2019

1st bio-sensor use in  
Phase III drug trial for  
Huntington disease



---

# CHeT Units

---

CTCC

p.7

Clinical Trials Coordination Center

---

CMSU

p.9

Clinical Materials Services Unit

---

CHeT Analytics

p.10

---

CHeT Innovation

p.11

---

CHeT Outcomes

p.12

---



# CTCC

## Clinical Trials Coordination Center

### **DIRECTOR**

Cindy Casaceli,  
MBA

CTCC specializes in the development, management, and conduct of clinical research studies and provides a full range of research and clinical trial management support services that facilitate the conduct of clinical research from study concept through data analysis, publication and FDA approval. Over the past 30 years, the CTCC has managed the conduct of more than 130 clinical research studies with 45 sponsors (government, industry & private) that enrolled over 40,000 research participants in US, Canada, Europe, New Zealand and Australia.

Our clinical research expertise includes:

- Novel and adaptive trial design**
- Study protocol development and training**
- Project, data, and site management**
- Contract facilitation and negotiation**
- Site selection based on key performance indicators**
- Remote, risk-based quality management, and on-site monitoring**
- Statistical analysis, modeling, and data mining**
- Data sharing and visualization**
- Investigational New Drug/Investigational Device Exemption support (over 25 submissions)**
- Remote sensor technology**
- Study communication via blogs, videos, and other social media**
- Accelerated enrollment and closeout**
- Neurologic and cognitive outcome measures**
- Data standards (CDISC, STDM, CDASH, CDE)**

CTCC has the infrastructure to conduct worldwide, high quality, regulatory compliant multi-center clinical research.

**Over 200 credentialed investigators and coordinators**

**Direct web-based data entry and ePRO**

**Access to over 100 research study datasets**

**Data visualization tools and templates**

**Clinical Trial Management Systems (21 CFR part 11 compliant)**

**Over 60 SOPs and guidelines for audit readiness**

CTCC study teams include:

**Clinical project manager**

**Medical and site monitor**

**Database manager and programmer**

**Clinical data manager and information analyst**

**Biostatistician, data scientist, data visualization analyst**

**Administrative support**

CTCC works to achieve study start-up, enrollment, database lock and regulatory submission at an accelerated pace.

**Long-standing relationships with clinical sites**

**Direct to participant trials**

**Competitive site startup**

**Customized disease template documents**

**Experienced study teams with disease specific expertise**

**Central IRB experience**

# CMSU

## Clinical Materials Services Unit

### **EXECUTIVE DIRECTOR**

Cornelia Kamp,  
MBA

The staff of CMSU have over 150 years of collective pharmaceutical experience and have serviced 15-20 multi-center studies concurrently, with average study size of 200 participants, 25 sites and up to 5 years in duration.

CMSU has provided regulatory support for 14 investigator initiated IND s, services to 56 drug and device multi-center clinical trials, and drug/device supplies to over 14,500 participants at more than 1,100 sites.

CMSU offers comprehensive clinical trial supply services including:

**Secondary packaging and labeling of clinical trial materials (drugs and devices)**

**Distribution services/strategies (including cold chain)**

**Package development, integrity & performance testing**

**Label design and printing (21 CFR part 11 compliant)**

**Storage options (room temperature and 2-8°C)**

**Clinical supply chain strategy & management**

**Secure environment**

**Returns management/destruction**

CMSU also provides project management support:

**Kit design to align with dispensing visits**

**Creation of drug accountability logs and operations manual**

**Selection/auditing GMP-compliant contract manufacturing organizations**

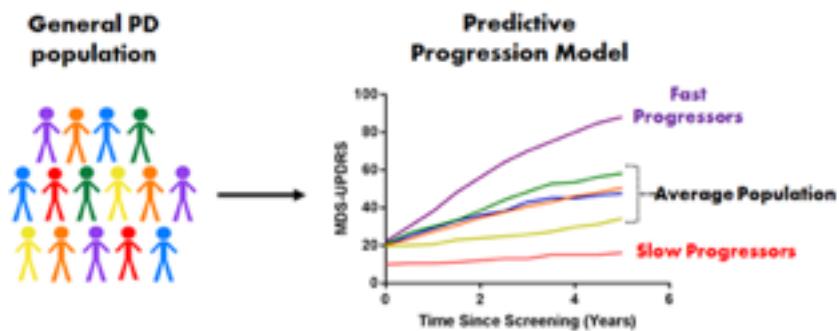
**Management of expiration dates**

# CHeT Analytics

## DIRECTOR

Charles Venuto, Pharm.D.

CHeT Analytics leverages one of the world's largest repositories of clinical trial data for Parkinson's and Huntington's diseases to improve the efficiency and conduct of clinical trials. One early effort is to identify a targeted sub-population to delineate the effects of the drug versus the underlying condition.



In addition, CHeT Analytics is developing predictive models that forecast the rate of clinical progression in Parkinson's disease using artificial intelligence. This information can be used to differentiate participants in clinical trials who are likely to be slow or fast progressors.



CHeT Analytics is working toward applying these disease models to clinical trial simulations. The hope is that investigators and sponsors will soon be able to predict the likely outcomes of clinical trials before they occur.

---

# CHeT Innovation

**DIRECTOR**

Ray Dorsey,  
MD

Virtual (or “site-less”) studies use video conferencing to conduct remote assessments, eliminate geographic barriers to participation, and allow for more efficient study conduct. New tools, such as smartphones and sensors, can be incorporated into clinical trials and enable objective and frequent assessments of participants in real-world settings.

## Bringing research to participants

CHeT has pioneered the use of these new technologies for over a decade. CHeT has conducted a dozen studies of virtual visits that have reached more than 1500 participants throughout the country. In addition, we now use video visits to care for over 400 individuals with Parkinson’s disease throughout New York state who receive expert care without ever leaving their homes.

## High frequency assessments

CHeT has also pioneered studies of smartphones, wearable, and invisible sensors. Over 20,000 individuals from every state in the country participated in the mPower Parkinson’s disease smartphone study that CHeT helped support with colleagues at Sage Bionetworks. These and ten other studies capture how individuals feel and function in their natural environment and provide new insights into the disease and assess the effectiveness of experimental and approved therapies.

# CHeT Outcomes

**DIRECTOR**

Chad Heatwole,  
MD, MS-CI

CHeT Outcomes focuses on developing and validating disease-specific patient-reported outcome measures (PROMs) for use in clinical trials and FDA drug-labeling claims. Our group has developed 62 instruments, including short forms, and translated versions in 10 languages.

Over the last ten years, our PROMs have been extensively used in therapeutic trials worldwide, including those sponsored by academia, industry and government. As therapies are developed, outcome measures that can reliably and sensitively detect meaningful changes in disease burden over time are critical. The FDA has identified disease-specific PROMs as a valid, responsive, and potentially ideal mechanism to measure therapeutic change during clinical trials. Our lab develops these instruments from the ground up to fully satisfy all FDA criteria.

## Our instruments

Our instruments measure the multifaceted, patient-perceived disease burden in individual diseases. Our team of epidemiologists, biostatisticians, qualitative researchers, patient advocates, linguists, computer programmers, and neurologists has developed disease-specific PROMs including instruments for the following diseases:

- Charcot-Marie-Tooth disease
- Congenital myotonic dystrophy
- Facioscapulohumeral muscular dystrophy
- Huntington's disease
- Myotonic dystrophy type-1
- Myotonic dystrophy type-2
- Spinal muscular atrophy

# Key Clinical Trials

## HUNTINGTON'S DISEASE

### FIRST-HD

**90 Participants**

A randomized, double-blind, placebo-controlled study of SD-809 extended release for the treatment of chorea associated with Huntington's disease.

**FDA Approval April 2017**

### TETRA-HD

**72 Participants**

A randomized, double-blind, placebo-controlled study of tetrabenazine for the treatment of Huntington's chorea.

**FDA Approval August 2008**

### SIGNAL

**301 Participants**

A study in individuals with late prodromal and early manifest Huntington's disease to assess the safety, tolerability, pharmacokinetics, and efficacy of pepinemab. (VX15/2503)

**PARKINSON'S DISEASE****DATATOP****800 Participants**

A 2 x 2 factorial, double-blind, placebo-controlled, phase III multi-center clinical trial in participants with early Parkinson's disease to assess the efficacy of tocopherol and deprenyl.

**NILO-PD****76 Participants**

A randomized, double-blind, placebo-controlled, phase II, study to define the safety, tolerability, clinical and exploratory biological activity of the chronic administration of Nilotinib in participants with Parkinson's disease.

**336 Participants**

A Phase III double-blind placebo-controlled parallel group study of isradipine as a disease modifying agent in participants with early Parkinson's disease.

**PPMI****1,700 Participants**

The Parkinson's Progression Markers Initiative is a global, longitudinal observational study seeking markers of progression in Parkinson's disease.

---

## OTHER RARE NEUROLOGICAL DISORDERS

### HYPHOP

**42 Participants**

---

A randomized, controlled study of acetazolamide vs. dichlorphenamide vs. placebo in individuals with hyperkalemic and hypokalemic periodic paralysis.

[FDA Approval August 2015](#)

### FACOMS

**1000+ Participants**

---

Friedreich's Ataxia Clinical Outcome Measure Study.

### STEADFAST

**86 Participants**

---

Randomized, placebo-controlled clinical trial evaluating the safety, pharmacokinetics, and efficacy of Actimmune in children and young adults with Friedreich's ataxia.

We have conducted additional clinical trials for other conditions, including dental caries, epilepsy, HIV, influenza, intracranial hypertension, stroke, and testicular cancer.



---

# Novel Digital Studies

---



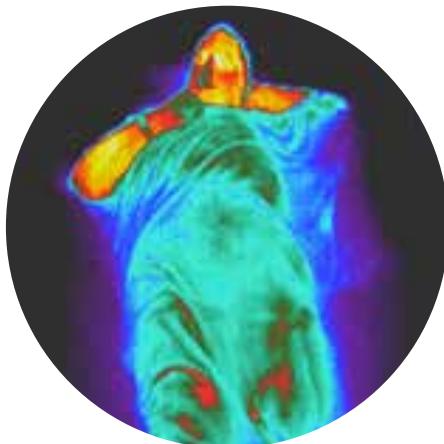
## WATCH-PD

Evaluate the ability of sensors to assess features and progression of symptoms in early, untreated Parkinson's disease. Sensor assessments at home and in the clinic are compared to traditional in-person assessments.

---

100 participants (Currently recruiting)

Collaborator : Biogen



## Scratch and Sleep Quantification in Atopic Dermatitis (SQUAD)

Assess the use of wearable devices, sensors, polysomnography, and video to detect and quantify scratching. Evaluate the relationship between patient-reported outcomes and scratching and sleep metrics from wearable devices and sensors.

---

45 Participants

Collaborator : Pfizer



## AT-HOME PD

Evaluate clinical outcomes using video visits in a virtual national observation study. Capture real-world data using a Parkinson's disease-specific smartphone application.

220 Participants

Collaborators : Massachusetts General Hospital, Northwestern University, Sage Bionetworks, NIH



## Valor-PD

Use video visits to evaluate the longitudinal change in individuals at genetic risk (due to mutations in the LRRK2 gene) of Parkinson's disease.

Develop a cohort of participants ready for clinical trials of gene-directed therapies.

300 Participants (currently recruiting)

Collaborators : 23andMe, NIH

---

# Select Publications

---

Zhan A, Mohan S, Tarolli C, Schneider RB, Adams JL, Sharma S, Elson MJ, Spear KL, Glidden AM, Little MA, Terzis A, Dorsey ER, Saria S. Using smartphones and machine learning to quantify Parkinson disease severity: the mobile Parkinson disease score. *JAMA Neurology* 2018;75:876-880.

Mongiovi P, Dilek N, Garland C, Hunter M, Kissel JT, Luebbe E, McDermott MP, Johnson N, Heatwole C. Patient reported impact of symptoms in spinal muscular atrophy. *Neurology* 2018;91:e1206-14.

Global Burden of Disease 2016 Parkinson's Disease Collaborators. Global, regional, and national burden of Parkinson's disease in 1990-2016: a systematic analysis of the Global Burden of Disease Study 2016. *Lancet Neurology* 2018;17:939-953.

Dorsey ER, Bloem BR. The Parkinson pandemic: a call to action. *JAMA Neurology*. 2018;75:9-10.

Augustine ER, Dorsey ER, Saltonstall P. The care continuum – an evolving model for care and research in rare diseases. *Pediatrics* 2017;140(3).

Latourelle JC, Beste MT, Hadzi TC, Miller RE, Oppenheim JN, Valko MP, Wuest DM, Church BW, Khalil IG, Hayete B, Venuto CS. Large-scale identification of clinical and genetic predictors of motor progression in patients with newly diagnosed Parkinson's disease: a longitudinal cohort study and validation. *Lancet Neurology* 2017;16:908-916.

Dorsey ER, Papapetropoulos S, Xiong M, Kieburtz K. The first frontier: digital biomarkers for neurodegenerative disorders. *Digital Biomarkers* 2017;1:6-13.

Schobel SA, Palermo G, Auinger P, Long JD, Ma S, Khwaja OS, Trundell D, Cudkowicz M, Hersch S, Sampaio C, Dorsey ER, Leavitt BR, Kieburtz KD, Sevigny JJ, Langbehn DR, Tabrizi SJ. Motor, cognitive, and functional declines contribute to a single progressive factor in early HD. *Neurology* 2017;89:2495-2502.

Huntington Study Group. Effect of deutetrabenazine on chorea among patients with Huntington disease: a randomized clinical trial. *JAMA* 2016;316:40-50.

Dorsey ER, Topol EJ. The state of telehealth. New England Journal of Medicine. 2016;375:154-61.  
Nalls MA, Keller MF, Hernandez DG, Chen L, Stone DJ, Singleton AB; Parkinson's Progression Marker Initiative investigators. Baseline genetic associations in the Parkinson's Progression Markers Initiative. *Movement Disorders* 2016;31:79-85.

Dorsey ER, Venuto C, Harris D, Venkataraman V, Kieburtz K. Novel methods & technologies for 21st century clinical trials. *Jama Neurology* 2015;72:582-8.

Heatwole C, Bode R, Johnson N, Quinn C, Martens W, McDermott MP, Rothrock N, Thornton C, Vickrey B, Victorson D, Moxley R 3rd. Patient-reported impact of symptoms in myotonic dystrophy type 1 (PRISM-1). *Neurology* 2012;79:348-57.

Cialone J, Augustine EF, Newhouse N, Vierhile A, Marshall FJ, Mink JW. Quantitative telemedicine ratings in Batten disease. Implications for rare disease research. *Neurology* 2011;77:1808-11.

Parkinson Study Group. A controlled, randomized, delayed-start study of rasagiline in early Parkinson disease. *Archives of Neurology* 2004;61(4):561-566.

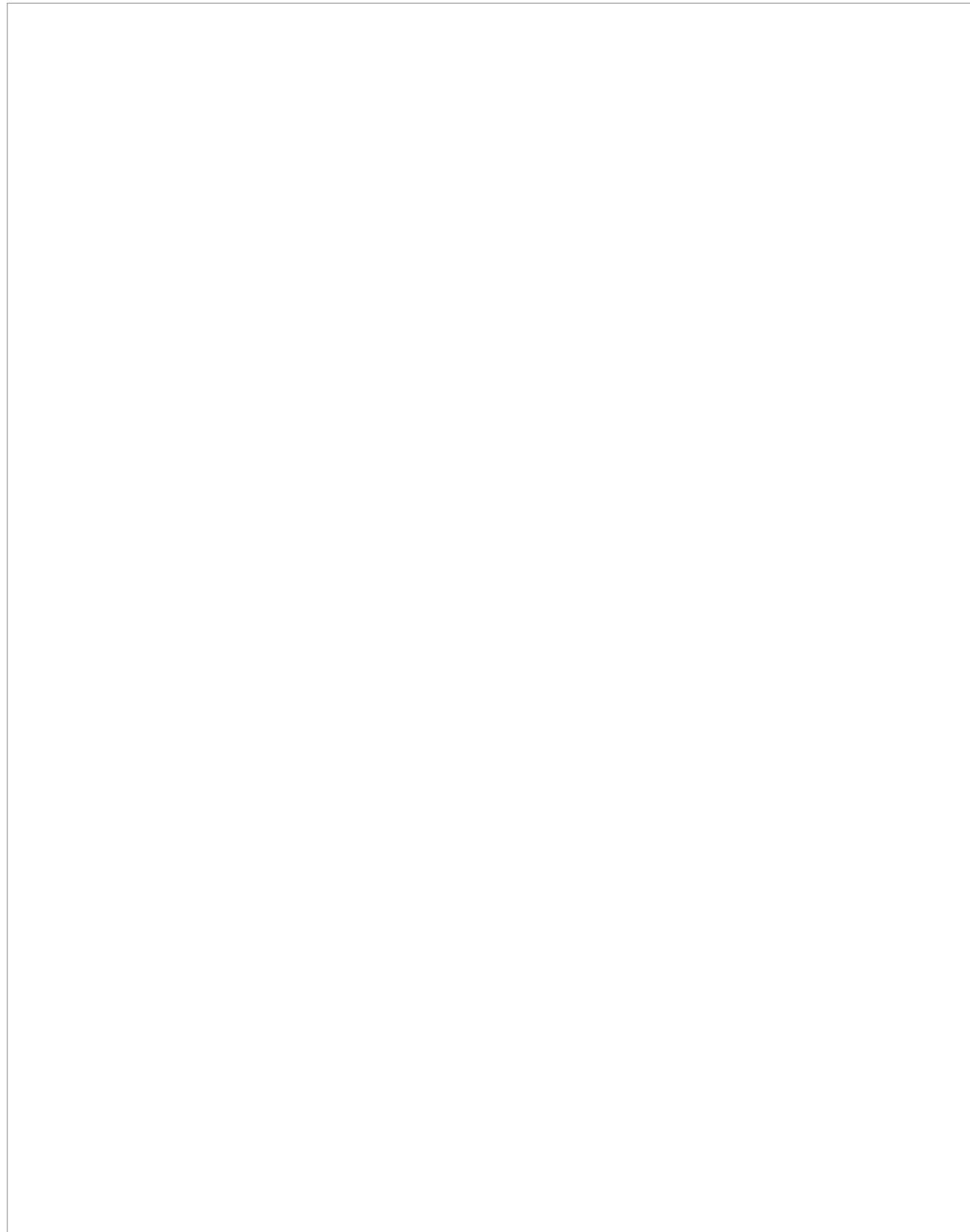
The Parkinson Study Group. Effects of tocopherol and deprenyl on the progression of disability in early Parkinson's disease. *New England Journal of Medicine* 1993; 328:176-183.

# Notes

---

# Notes

# Notes



Let's do the  
unprecedented  
together.

**CONTACT INFORMATION**

Ray Dorsey, MD  
[ray.dorsey@chet.rochester.edu](mailto:ray.dorsey@chet.rochester.edu)  
585.275.0663

**ADDRESS**

Center for Health + Technology  
Saunders Research Building  
265 Crittenden Blvd, CU 420694  
Rochester, NY 14642