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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Therapy</th>
<th>Sponsor</th>
<th>Disease</th>
<th>Brand Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Rotigotine</td>
<td>Schwarz Pharma</td>
<td>Parkinson’s disease</td>
<td>Neupro</td>
</tr>
<tr>
<td>2008</td>
<td>Tetrabenazine</td>
<td>Prestwick Pharmaceuticals</td>
<td>Huntington’s disease</td>
<td>Xenazine</td>
</tr>
<tr>
<td>2015</td>
<td>Dichlorphenamide</td>
<td>Taro Pharma</td>
<td>Primary Hypokalemic &amp; Primary Hyperkalemic Periodic Paralysis</td>
<td>Keveyis</td>
</tr>
<tr>
<td>2017</td>
<td>Deutetrabenazine</td>
<td>Teva Pharmaceuticals</td>
<td>Huntington’s disease</td>
<td>Austedo</td>
</tr>
<tr>
<td>2006</td>
<td>Rasagiline</td>
<td>Teva Pharmaceuticals</td>
<td>Parkinson’s disease</td>
<td>Azilect</td>
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<td>2003</td>
<td>Entacapone</td>
<td>Orion Corporation</td>
<td>Parkinson’s disease</td>
<td>Comtan</td>
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<tr>
<td>1997</td>
<td>Pramipexole</td>
<td>Pharmacia &amp; Upjohn</td>
<td>Parkinson’s disease</td>
<td>Mirapex</td>
</tr>
</tbody>
</table>
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
- **2015**: 1st Apple ResearchKit app for a neurological disorder
- **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’s disease

2020
1st fully remote multi-site clinical trial for PD using an interventional device

2021
1st multi-faceted PD study on disease progression, remote assessments and digital tools for real world assessments.

UR-Udall
# CHeT Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>CHeT - CTCC</td>
<td>p.7</td>
</tr>
<tr>
<td>Clinical Trials Coordination Center</td>
<td></td>
</tr>
<tr>
<td>CHeT - CMSU</td>
<td>p.9</td>
</tr>
<tr>
<td>Clinical Materials Services Unit</td>
<td></td>
</tr>
<tr>
<td>CHeT Analytics</td>
<td>p.10</td>
</tr>
<tr>
<td>CHeT Innovation</td>
<td>p.11</td>
</tr>
<tr>
<td>CHeT Outcomes</td>
<td>p.12</td>
</tr>
</tbody>
</table>
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
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 INDs, 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 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.
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 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

- **Participants**: 90

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

- **Participants**: 72

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

**FDA Approval August 2008**

### SIGNAL

- **Participants**: 301

A study in individuals with late prodromal and early manifest Huntington’s disease to access 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

<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Description</th>
</tr>
</thead>
</table>
| HYPHOP  | 42 Participants | A randomized, controlled study of acetazolamide vs. dichlorphenamid 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.

132 Participants (82 PD, 50 Control)
Collaborators: Biogen, Takeda

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.

277 Participants
Collaborators: 23andMe, NIH
Select Publications


Let’s do the unprecedented together.

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