

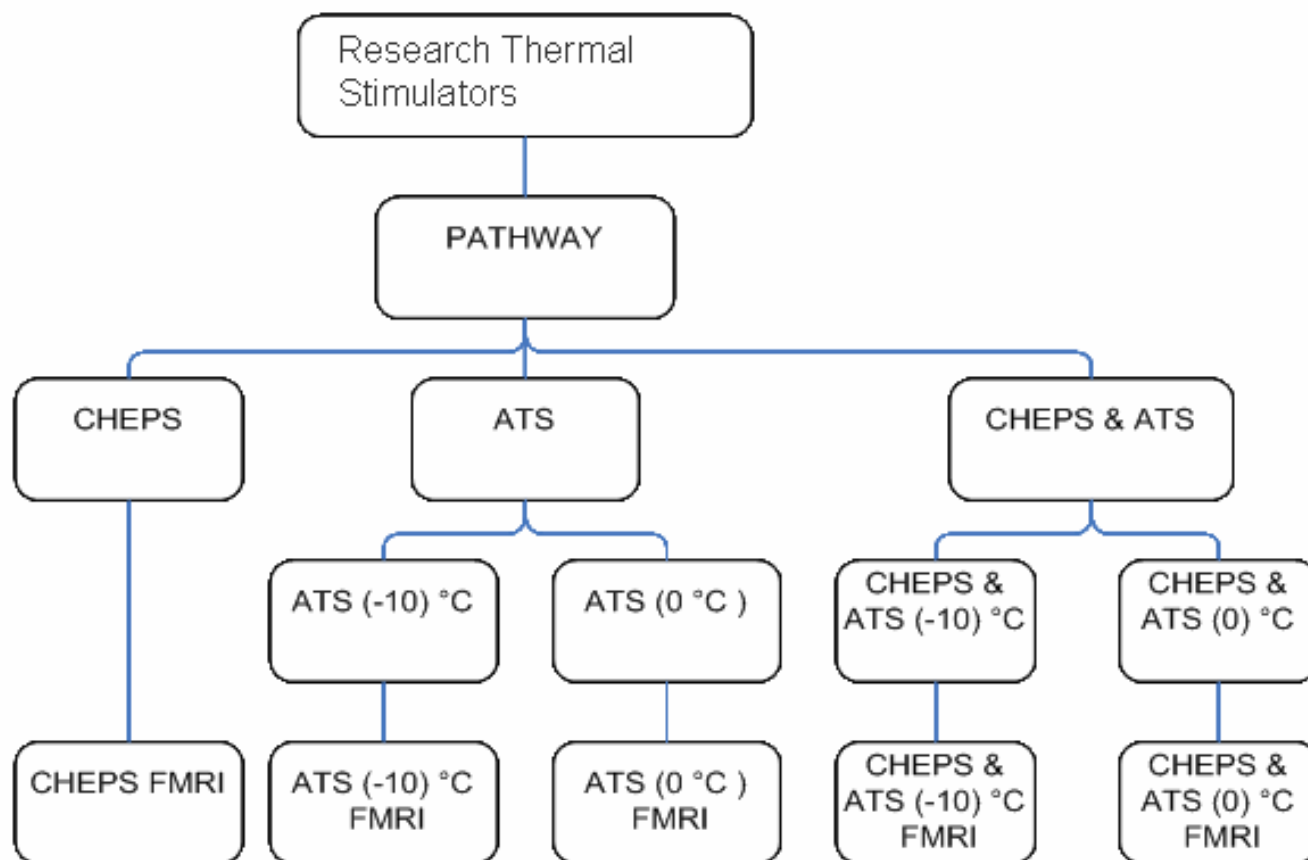
# PATHWAY & TSA-II: Applications and the Market



# PATHWAY

## Pain & Sensory Evaluation System

A computerized thermal stimulator designed for advanced Neurological & Pain research



# PATHWAY

## Hardware capabilities:

- ✓ Accurate temperature control loop (200 Hz)
- ✓ Self test and built-in test (BIT)
- ✓ In & Out event synchronization
- ✓ Computerized Visual Analog Scale (COVAS)
- ✓ Manual trigger
- ✓ Response Unit
- ✓ Emergency safety shut down
- ✓ upgradeable configuration

# PATHWAY

## Software Capabilities:

- ✓ 32 Bit .Net Microsoft based technology
- ✓ Top level design for safe and friendly usage
- ✓ License protected
- ✓ Authorization levels
- ✓ Patient, program and test results management
- ✓ Database management
- ✓ Demo and online modes

# PATHWAY Advantages

- ✓ Large thermodes, enabling activation of greater number of nociceptors, thus evoking a stronger brain response
- ✓ Stimulation protocol - Stimulation duration can be determined for selectively activating the A- $\delta$  and C fibers (responsible for pain sensation)
- ✓ Superior safety mechanisms
- ✓ Quick set-up and test initiation
- ✓ Easy hardware & software upgrading
- ✓ A mobile system
- ✓ Temperature measurement on the thermode's active area

# PATHWAY model CHEPS

## Unique Features:

- ✓ Heating rate of up to 70°C/sec.
- ✓ 32°C to 55°C in 250 ms
- ✓ Cooling rate of down to 40°C/sec.
- ✓ For Cold sensation EP - cooling rate of down to 15°C/Sec. from adaptation to 25°C
- ✓ 27 mm diameter Thermode - stronger cerebral response



# PATHWAY model CHEPS

## Applications:

- ✓ Objective measurement of pain perception
- ✓ Pain Evoked Potentials: Selective A- $\delta$  and C fibers stimulation
- ✓ Heat Pain & Warm Sensation
- ✓ Cold Sensation Evoked Potentials
- ✓ Temporal Summation (Windup)
- ✓ Sensory function investigation
- ✓ Flexible test algorithms

# PATHWAY model CHEPS

## Accessories:

✓ BrainPath 8 or 16 channel EEG system



✓ Computerized Visual Analog Scale (CoVAS)



✓ Software development kit (SDK)

✓ fMRI Thermode

✓ fMRI Filter



# PATHWAY model ATS

## Unique features :

- ✓ Thermal stimulation of up to 54°C
- ✓ Extreme cold pain stimulation of down to -10°C
- ✓ Thermodes of several sizes (mm): 30x30, 16x16



Thermode 30x30mm



Thermode 16x16mm

# PATHWAY model ATS

## Applications:

- ✓ Rapid and reliable measurement of Thermal Sensation & Pain thresholds
- ✓ Cold Pain studies
- ✓ Variety of test protocols
- ✓ Flexible test algorithms

# PATHWAY model ATS

## Accessories:

- ✓ Patient response unit
- ✓ 16x16mm thermode
- ✓ Computerized Visual Analog Scale (CoVAS)
- ✓ fMRI thermodes
- ✓ fMRI filter
- ✓ Software development kit (SDK)



# fMRI PATHWAY

- ✓ Both CHEPS and ATS models can be configured for use in magnetic environment
- ✓ When using fMRI PATHWAY (ATS / CHEPS) researchers can administer noxious and innocuous stimuli and obtain the brain's response
- ✓ In PATHWAY model CHEPS: Stimuli can be synchronized with an fMRI compatible EEG system for multi-modality study of selective nerve fibers activation and cortical response

# fMRI PATHWAY

## Accessories:

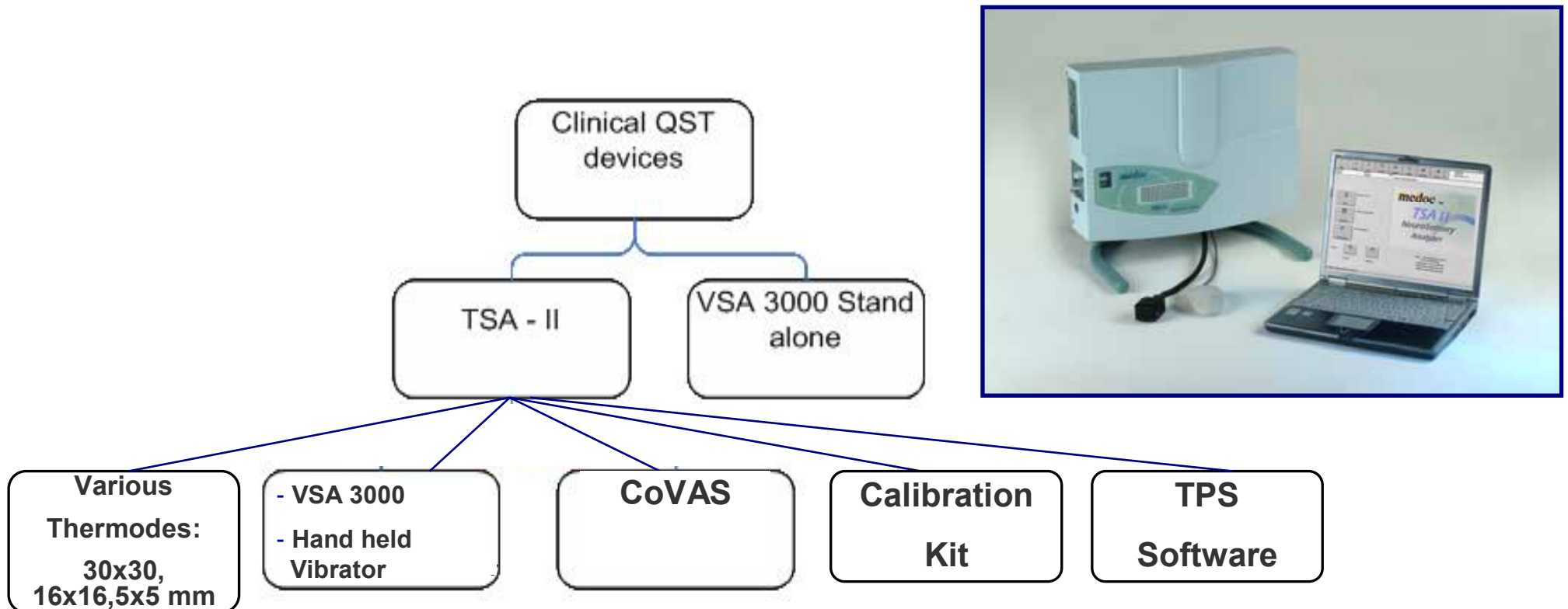
- ✓ 10m long CHEPS Thermode
- ✓ 10m long ATS Thermode
- ✓ fMRI filter
- ✓ fMRI CoVAS
- ✓ 10m long panic button
- ✓ 10m long Patient Response Unit



# TSA-II

## NeuroSensory Analyzer

Thermal & Vibratory Quantitative Testing (QST) for evaluating nerve impairment in small and large sensory fibers



# TSA-II

## Unique features:

- ✓ Wide stimulation range: 0°C to 50°C
- ✓ Built-in Normative data with automatic conclusions
- ✓ Comprehensive report generator
- ✓ Thermodes of several sizes (mm): 30x30, 16x16, 5x5



**Standard 30x30  
mm**



**Small 16x16 mm**



**Mini 5x5 mm**

# TSA-II

## Applications:

- ✓ Investigation of small & large fiber neuropathies
- ✓ Identification of early progression of neurological deficit
- ✓ Assists in treatment selection and follow-up
- ✓ Early detection of diabetic neuropathy of small nerve fibers
- ✓ Rapid and reliable measurement of thermal sensation thresholds and pain thresholds
- ✓ Efficient tool for detecting CRPS

# TSA-II

## Accessories:

✓ VSA (Vibratory Sensory Analyzer)



✓ Hand held vibrator



✓ Computerized Visual Analog Scale (CoVAS)



✓ Various thermode sizes (30x30 / 16x16 / 5x5 mm)

✓ Digital Calibration Kit



# Market Segmentation



# The PAIN Market

## Statistics of pain in the USA

- **75 million** experiencing serious pain
- **50 million** are diagnosed with chronic pain
- **25 million** suffer acute pain due to injury or surgery
- **45%** of all Americans seek care for constant pain at some point in their lives

## Attitudes Towards Clinicians:

- **25%** Think that doctors don't know to control their pain
- **20%** feel that doctor don't consider pain as problem
- **15%** report never being asked about their pain

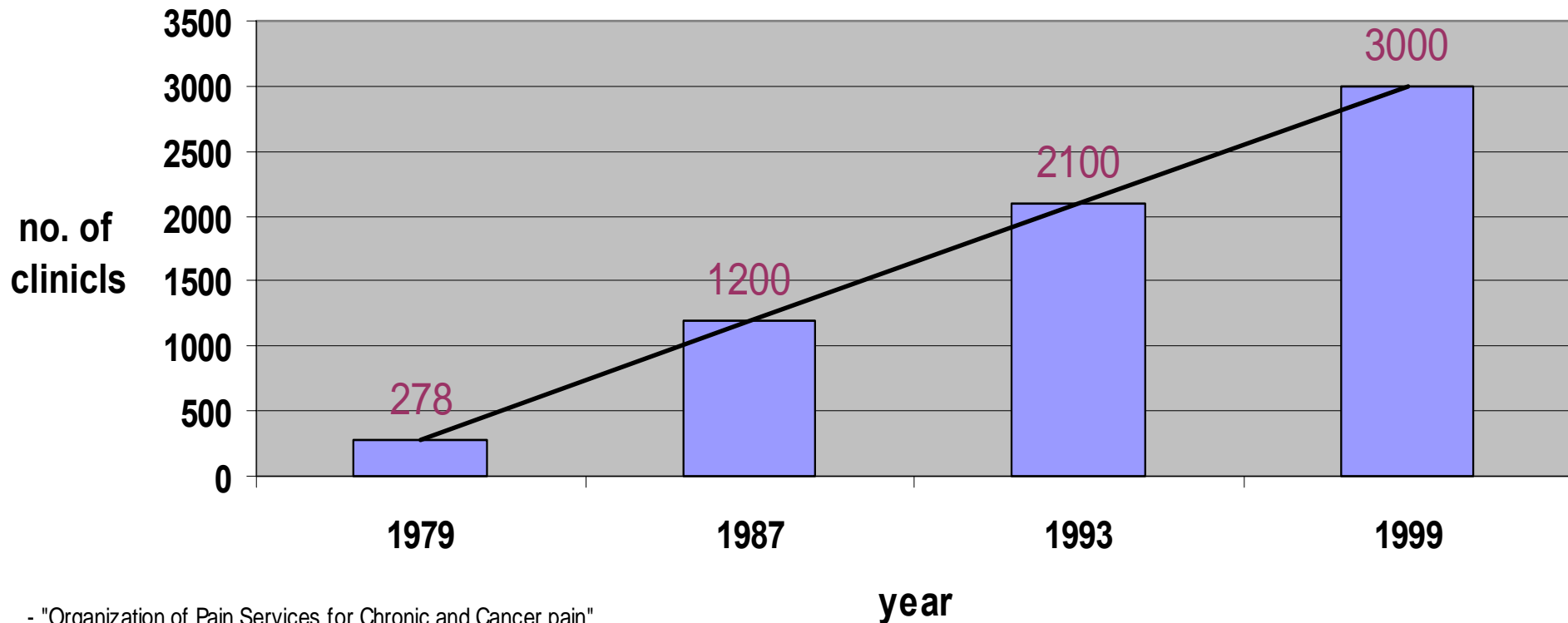
American J. Med, 105(1B):2S-7S, 1998

# The PAIN Market

- In the past, Pain Clinics were a part of either the Anesthesiology or the Neurology departments.
- Today, Pain is considered an independent discipline, and as such the number of Pain Clinics is rapidly growing.
- Patients suffering from Chronic / Acute Pain are more aware of these Pain clinics, and turn to them seeking for solutions.
- Misdiagnosis and under-treatment of Pain conditions continue to prove harmful, reinforcing the need for better Pain management.
- Billions of dollars are invested annually in finding solutions to Pain conditions and their validation.

# The PAIN Market

## Increasing Number of Pain clinics in the U.S



- "Organization of Pain Services for Chronic and Cancer pain"  
Bonica JJ, J Pharm Care Pain Symp Control

# The PAIN Market

Newsweek Magazine dedicated a special issue (May 2003) to Pain treatment suggesting that pain has become a disease on its own and no longer should be viewed as a symptom of other medical conditions.

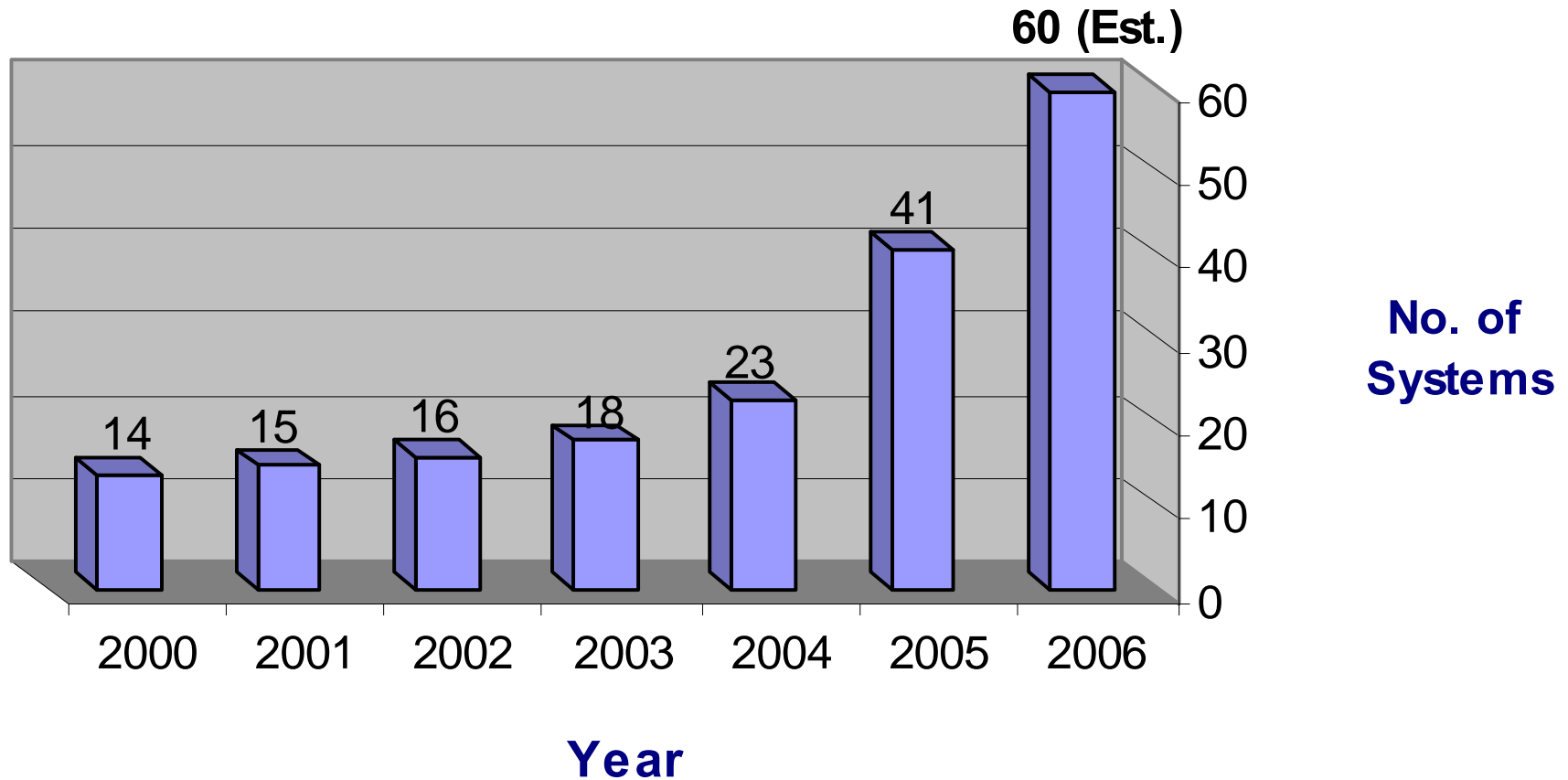


# The fMRI Market

- The PATHWAY is used as a thermal stimulator for advanced pain research in fMRI
- fMRI is a rapidly growing market. With each year, more and more systems are sold for use in fMRI application.
- fMRI has become a fundamental tool in the western world, and the same trend is seen in the Far East, where fMRI studies achieve meaningful results.
- Worldwide researchers in the functional MRI (fMRI) field are using Medoc's fMRI compatible devices for investigating the nervous system and cortical functioning
- fMRI can be used as a means of validation for Pain conditions treatments
- The increasing number of scientific fMRI related articles in which the methodology includes Medoc's devices - reinforce the company's important role in pain management
- Medoc sold about 150 systems worldwide for fMRI use only

# The fMRI Market

## fMRI Sales per year



# fMRI Users

## Selected fMRI users list:

- ✓ NIH (National Institute of Health)
- ✓ Massachusetts General Hospital
- ✓ University of Toronto
- ✓ University of Munich
- ✓ National Yang-Ming University, Taipei



# The Diabetic Neuropathy Market

## A few statistics from the U.S.A.

- 20.8 million, 7% of the population, have diabetes
- 14.6 million are diagnosed while 6.2 million are not
- 41 million are pre-diabetic
- In 2005, 1.5 million new cases of diabetes were diagnosed in people aged 20 years or older
- Age 20 - 60: 9.6% of all people in this age group have diabetes (20.6 million)
- Age 60 or older: 20.9% of all people in this age group have diabetes (10.3 million)

# The Diabetic Neuropathy Market

- The number of patients suffering from diabetes is growing every year. While in the past diabetes was considered a western world illness, today it had spread to the Far East and Asia too
- Excessive research is made in the field of Diabetic Neuropathy in order to find new methods for early diagnostics and treatment
- Research proves that thermal & vibratory stimuli could detect nerve impairment in early stages of Diabetic Neuropathy, sometimes 3 years before conventional methods such as EMG
- This early detection is possible thanks to the evaluation of the small (A- $\delta$  and C) & Large (A- $\beta$ ) sensory fibers, which are the first ones to be damaged in case of DN

# The Diabetic Neuropathy Market

- **Pharmaceutical companies ( Eli Lilly, Takeda, Dainippon, etc. ) invest Billions of dollars, seeking for a compound / drug for diabetic neuropathy (which doesn't exist today)**
- **Medoc products, which are considered the Gold –Standard in QST, are used as a Primary or Secondary Efficacy Parameters in Clinical Trials, since our products are validated for such trials**
- **The key opinion leaders in the field of diabetic Neuropathy are using Medoc's systems (Vinik, Bril, Tesfaye, Valensi, Ziegler, Kempler, Arezzo, Malik, Etc.)**

# The Pharmaceutical Trials Market

- Medoc products are used by world-known pharmaceutical companies conducting clinical trials – such as Pfizer, GlaxoSmithKline, Merck, etc.
- Prospective compounds for Neurological, diabetes, analgesic and Pain conditions can be validated by examining the nervous functionality using Medoc's systems
- This validation is enabled due to the abilities to :
  - Find thermal thresholds of sensations and pain
  - Selectively activate small and large sensory nerve fibers which are responsible for mediating pain inputs
  - Form neurological phenomena as Temporal Summation for detection of nervous abnormalities
  - Objective response to Pain by recording Brain Waves using EEG

# The Pharmaceutical Trials Market

## Clinical Trials benefits

- New “surrogate marker” for evaluation of new compounds efficacy
- Providing effectiveness data starting in Phase-I of Clinical Trials
- Helping in decision making between multiple compounds, especially in Clinical Trials Phase-IV
- Reducing statistical sample size
- Reducing time to market
- Saves money and other resources

# Selected Pharmaceutical Companies

Medoc's systems have also been selected for use in pre-clinical and multi-center pharmaceutical trials of companies such as:

✓ Pfizer



✓ GlaxoSmithKline



✓ Merck



✓ AstraZeneca



✓ Sigma Tau



✓ Dainippon



✓ Unilever

