The Evolution of Pain Management

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Chronic pain affects 20% of adults worldwide

Harstall and Ospina, 2003
Chronic Pain in the USA affects more than 90 million people
<table>
<thead>
<tr>
<th>Condition</th>
<th>Prevalence</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>76.2 million</td>
<td>(Nat. Ctr. Health Stats)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>20.8 million</td>
<td>(Amer. Diab. Assoc)</td>
</tr>
<tr>
<td>CAD/Stroke</td>
<td>18.7 million</td>
<td>(Amer. Heart Assoc)</td>
</tr>
<tr>
<td>Cancer</td>
<td>1.4 million</td>
<td>(Amer. Cancer Soc)</td>
</tr>
</tbody>
</table>
Chronic Pain Annually Causes:

- 50,000,000 chronic disabilities
- 515,000,000 lost work days
- $50 billion of cost to employers
Overall, workers lost an average of 4.6 hours per week of productive time due to a pain condition

American Productivity Audit, 2002
Low Back Pain Alone

- Causes $50-100 billion in direct and indirect costs
- 75% of these costs are attributed to 5% of patients who become disabled due to inadequate relief of pain
The cost of health care for chronic pain exceeds the combined costs of the treatment of coronary artery disease, cancer and AIDS.
Pain Can Kill

- John Liebeskind, Pain, 1991
Pain Can Drive You Crazy
Patients with Chronic Back Pain showed 5-11% less neocortical gray matter volume than control subjects which is equivalent to that lost in 10-20 years of normal aging.
Pain produces a 1.3 cm$^3$ loss of gray matter for every year of chronic pain

- Apkarian et al, 2004
Latin. poema, punishment
Greek. poinE, penalty
Poine

- Greek Goddess of Revenge sent to punish mortal fools who had angered the gods
Pain = Frustration of Desires
Ancient Remedies for Pain

- Pressure
- Water
- Heat
- Sun
“Better lay off using the heating pad.”
To prepare a mustard poultice, mix 1/2 cup mustard powder with 1 cup flour and stir hot water into the mix to form a paste. Spread the mixture on a piece of cotton or muslin has been soaked in hot water. Cover with a second piece of dry material. Lay the moist side of the poultice across the person's chest or back.
Soporific Sponge

- Many “recipes” have come down from the Middle Ages.
- Opium, mulberry, hyoscyamus, hemlock juice, mandragora …half a lettuce …and boil…
Electric Catfish
A GRAND EXHIBITION
OF THE EFFECTS PRODUCED BY INHALING NITROUS OXIDE, EXHILARATING, OR LAUGHING GAS!

WILL BE GIVEN AT The Music Hall

Saturday Evening, 13th 1845.

500 gallons of gas will be prepared and administered to all in the audience who desire to inhale it.

Men will be invited from the audience, to protect those under the influence of the gas from injuring themselves or others. This course is adopted that no apprehension of danger may be entertained. Probably no one will attempt to fight.

The effect of the gas is to make those who inhale it either laugh, sing, dance, speak or fight, &c. &c. according to the leading trait of their character. They seem to retain consciousness enough not to say or do that which they would have occasion to regret.

N. B. The gas will be administered only to gentlemen of the first respectability. The object is to make the entertainment in every respect, a genteel affair.

Those who inhale the gas once, are always anxious to inhale it the second time. There is not an exception to this rule.

No language can describe the delightful sensation produced. Robert Southey, poet, once said that "the atmosphere of the highest of all possible heavens must be composed of this gas."

For a full account of the effect produced upon some of the most distinguished men of Europe, see Hooper's Medical Dictionary, under the head of Nitrogen.

The history and properties of the gas will be explained at the commencement of the entertainment.

The entertainment will be accompanied by experiments in electricity.

Entertainment to commence at 7 o'clock.

Tickets 17 3/4 cents.

For sale at the principal booksellers and at the door.
LIVING MADE EASY.

PRESCRIPTION FOR SCOLDING WIVES.

Opium Poppy
History of Opium Use

- 3400 BC Sumerians cultivate “joy plant” in Mesopotamia
- 1300 BC Egyptians grow opium in Thebes and export it to the Phoenicians who move it to Greece and Europe
- 460 BC Hippocrates uses opium to treat disease
- 330 BC Alexander the Great introduces opium to Persia and India
- 400 AD Arabs introduce opium to China
- 1300 Opium disappears from European records for 200 years
- 1500 Portuguese rediscover Opium in China and initiate smoking of opium
- 1527 Paracelsus reintroduces opium as laudanum
- 1600 English ships bring opium from India to England
In 1700 the Dutch introduced smoking opium in a pipe to China.
1803 German chemist Friedrich Sertturner isolates morphine from opium

1827 Merck Company begins commercial manufacture of morphine in Germany
In 1843 Alexander Wood of Edinburgh first uses a syringe to inject morphine.
New Wonder Drug, 1845
"For children teething. Greatly facilitates the process of Teething, by softening the gums, reducing all inflammation; will allay ALL PAIN and spasmodic action, and is SURE TO REGULATE THE BOWELS. Depend on it, Mothers, it will give rest to yourselves and RELIEF AND HEALTH TO YOUR INFANTS. Sold by all chemists, at 1s 1/2d per bottle."
1874 CR Wright synthesizes diacetylmorphine in England by boiling morphine over a stove.

1895 Heinrich Dreser, working for the Bayer Company of Germany, synthesizes heroin by diluting morphine with acetyls and coins the name ‘heroin’
Bayer Introduces Aspirin in 1897
COUGH

The State of Clinical Experience Describes Glyco-Heroin (Smith) as a Respiratory Sedative Superior to All Known in the Prevention of Cough, Hoarseness, Colds, and Other Nervous and Malaise Avoiding the Toxic or Depressing Effects Which Characterize the Latter When Given in Doses Sufficient to Reduce the Reflex Irritability of the Bronchial, Tracheal, and Laryngeal Mucous Membranes.

THE PROBLEM
of administering drugs in proper doses to relieve cough will give the therapeutic curative of this drug but away, and with every atom of the most effective and the most significant effect.

HAS BEEN SOLVED BY
the pharmaceutical compound known as

GLYCO-HEROIN (Smith)

The results obtained with Glyco-Heroin (Smith) in the alleviation and cure of cough are reviewed by numerous clinical studies that have appeared in the medical journals within the past two years.

Scientifically Compounded, Scientifically Conceived, GLYCO-HEROIN (SMITH) simply stands upon its merits before the profession, ready to prove its efficacy to those interested in advances in the art of
Anti-Drug Campaigns

- 1729 Chinese Emperor Yung Cheng bans opium and its contraband trade begins.

- 1839 China orders foreign traders to surrender their opium inciting the first Opium War; China loses Hong Kong to the British.
1816 John Jacob Astor of New York joins the opium smuggling trade
1962 film based on a book written in 1821
Opium Booth
Chicago World’s Fair, 1893
History of Narcotics Laws

- 1874 San Francisco bans opium outside of opium dens in Chinatown
- 1878 Britain passes the Opium Act restricting opium to registered Chinese smokers and Indian “opium eaters”
"Reality is a crutch for people who can't handle drugs"
George Bernard Shaw
(1856 - 1950)
By 1896 1/350 Americans is an “opium eater”
Yes, it is quite the sight, Sally! Those are some beautiful colors. But I don't agree with you that this is better than opium.
Opium Den
New York City, 1908
- 1905 US bans opium
- 1906 US Pure Food and Drug Act
- 1914 US Harrison Act
SPECIAL TAX STAMP
UNITED STATES
INTERNAL REVENUE

THIS STAMP EXPIRES JUNE 30, 1932
THIS STAMP IS NOT TRANSFERABLE ON CHANGE OF OWNERSHIP OF THE BUSINESS

PRACTITIONER DISPENSING OPium, Etc.

YOUR REGISTRY NUMBER IS 2510, CL. 43

Issued by the Collector for the

John C. Rogers,
223½ 2nd St.,
Henderson, Ky.

Postmark: March 17, 1932
Prohibition creates crime and criminals and does not reduce the use of the substances of concern. It shifts funds flow from legitimate business and taxation by government to the support of large, international criminal organizations.

Loeser, 2003
- International illicit drug trade: $400 billion
- US expenditures on drug control: $30 billion
- Cost of imprisoning drug offenders: $30 billion
REMS

- Risk Evaluation and Mitigation Strategies
- FDA Amendments Act of 2007
- Public Hearing held May, 2009
- Primary target is long-acting opioids
- Likely will require education and certification of prescribers and national registries of prescribers and dispensers but none as of 2016
biofeedback
physiol learn
ice massage combined
1953
“The Management of Pain” by John Bonica

Introduction to the Concept of Multidisciplinary Pain Treatment
1960’s

- Establishment of the Pain Clinic at the University of Washington in Seattle
- Dedicated Pain Research Programs
- Gate Theory
1970’s

- Biophychosocial Approach
- Modulation of Afferents
- Multidisciplinary Movement
WHY PAIN HURTS
Unlocking an Agonizing Mystery
"BELIEVE IT OR NOT"

WILBUR PLUMHOFF
THE PAIN PROOF MAN

AS CARTOONED BY
ROBT. L. RIPLEY
1980’s

- Standards for Clinical Training
- Terminology Standardized
- Harvard Medical School CME Course
- Alternative Medicine
- Molecular Biological Research in Pain
1990’s

- Opioids for Nonmalignant Pain
- MRI/PET imaging of brain function
- Outcomes-based guidelines
HR 2344, Title VI, Section 1603
The calendar decade beginning JANUARY 1, 2001, is designated as the

“Decade of Pain Control and Research”
APS Agenda for the Decade of Pain Control

- Public awareness
- Professional awareness
- Public policy
- Research
2004

Medicare changes
“Pain Management” to
“Pain Medicine”
"Pain Medicine is a primary medical specialty based on a distinct body of knowledge and a well-defined scope of clinical practice that is founded on science, research and education. It is concerned with the study of pain, the prevention of pain and the evaluation, treatment and rehabilitation of persons in pain."
The California legislature has mandated 12 hours of CME on pain for every physician with a license in the state by 2006.
**First IASP International Pain Summit**

- Sept 3, 2010 in Montreal
- 126 countries represented
- All 126 representatives signed Declaration of Montreal which promotes human rights for those in pain
Declaration of Montreal

All people have the following rights:
- Access to pain management
- Information re pain management options
- Access to an appropriate range of pain relief strategies
- Access to appropriate medicines and health professionals
- Assessment and treatment by an interdisciplinary team
- A compassionate, empathetic and well-informed health policy framework
- Access to best-practice non-medication methods and to specialist-performed interventional methods
- Recognition of chronic pain as a disease entity
<table>
<thead>
<tr>
<th>Year</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>IASP</td>
</tr>
<tr>
<td>1975</td>
<td>ASRA</td>
</tr>
<tr>
<td>1979</td>
<td>APS</td>
</tr>
<tr>
<td>1983</td>
<td>AAA (AAPM)</td>
</tr>
<tr>
<td>1989</td>
<td>ISI S</td>
</tr>
<tr>
<td>1989</td>
<td>ABPM</td>
</tr>
<tr>
<td>1993</td>
<td>ABA certification</td>
</tr>
<tr>
<td>1998</td>
<td>APMA (ASI PP)</td>
</tr>
<tr>
<td>1999</td>
<td>ASRAPM</td>
</tr>
</tbody>
</table>
In 2016, there are 157 accredited anesthesiology residencies and 90 accredited anesthesia-based pain fellowship programs.
ACGME Anesthesia-Based Pain Programs

![Bar chart showing years 1998 to 2015 with values from 1998 (98) to 2015 (85).]
2008 ABA Requirements for Pain Fellowships

- Only one pain fellowship per hospital
- Exposure to anesthesia, neurology, PMR, psychiatry and 3 of these incorporated into program
Certificate of Added Qualifications in Pain Medicine = Subspecialty Certification in Pain Medicine
### Number of ACGME Pain Programs in 2016

<table>
<thead>
<tr>
<th>Type of Program</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesia-based</td>
<td>90</td>
</tr>
<tr>
<td>PMR-based</td>
<td>10</td>
</tr>
<tr>
<td>Neurology-based</td>
<td>2</td>
</tr>
<tr>
<td>Psychiatry-based</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>102</strong></td>
</tr>
</tbody>
</table>
ACGME Pain Trainees

Graph showing the number of ACGME Pain Trainees from 1994 to 2015.

- 1994: 100
- 1997: 150
- 2000: 200
- 2003: 250
- 2006: 300
- 2009: 350
- 2012: 400
- 2015: 450
PMR-Based Programs

- Harvard Medical School/Spaulding Rehabilitation Hospital
- Loma Linda University
- Louisiana State University
- Sinai Hospital of Baltimore
- Temple University Hospital
- University of Colorado-Denver
- U Texas Southwestern Medical School/J P Smith Hospital
- VA Greater Los Angeles Healthcare System
- Virginia Commonwealth University Health System
- Washington Hospital Center/National Rehabilitation Hospital
Neurology-Based Programs

- Memorial Sloan-Kettering Cancer Center
- University of South Florida
<table>
<thead>
<tr>
<th>Hospital Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albert Einstein at Beth Israel Medical Center</td>
<td>6</td>
</tr>
<tr>
<td>Massachusetts General Hospital</td>
<td>6</td>
</tr>
<tr>
<td>University of California (Davis) Health System</td>
<td>6</td>
</tr>
<tr>
<td>University of Texas MD Anderson Cancer Center</td>
<td>6</td>
</tr>
<tr>
<td>University of Texas Health Science Center at San Antonio</td>
<td>6</td>
</tr>
<tr>
<td>Virginia Commonwealth University Health System</td>
<td>6</td>
</tr>
<tr>
<td>Stanford University</td>
<td>7</td>
</tr>
<tr>
<td>Beth Israel Deaconess Medical Center</td>
<td>8</td>
</tr>
<tr>
<td>Brigham and Women’s Hospital</td>
<td>8</td>
</tr>
<tr>
<td>University of Pittsburgh Medical Center Hospitals</td>
<td>9</td>
</tr>
<tr>
<td>Cleveland Clinic Foundation Hospitals</td>
<td>10</td>
</tr>
</tbody>
</table>
Primary Specialties of Pain Diplomates

- Anesth: 56%
- PMR: 36%
- Neurol: 6%
- Psych: 1%

Adapted from Rathmell, 2010
## Pain Medicine Diplomates

<table>
<thead>
<tr>
<th>Year</th>
<th>ABA</th>
<th>ABPMR</th>
<th>ABPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993-2000</td>
<td>2539</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>185</td>
<td>97</td>
<td>39</td>
</tr>
<tr>
<td>2002</td>
<td>112</td>
<td>143</td>
<td>34</td>
</tr>
<tr>
<td>2003</td>
<td>153</td>
<td>279</td>
<td>26</td>
</tr>
<tr>
<td>2004</td>
<td>144</td>
<td>234</td>
<td>54</td>
</tr>
<tr>
<td>2005</td>
<td>169</td>
<td>127</td>
<td>42</td>
</tr>
<tr>
<td>2006</td>
<td>180</td>
<td>119</td>
<td>18</td>
</tr>
<tr>
<td>2007</td>
<td>199</td>
<td>65</td>
<td>22</td>
</tr>
<tr>
<td>2008</td>
<td>226</td>
<td>76</td>
<td>8</td>
</tr>
<tr>
<td>2009</td>
<td>217</td>
<td>75</td>
<td>17</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4119</td>
<td>1215</td>
<td>277</td>
</tr>
<tr>
<td>Expired/Revoked</td>
<td>2268</td>
<td>22</td>
<td>2</td>
</tr>
</tbody>
</table>
Anesthesiologists in Pain Fellowships

Year:
- 1990
- 1993
- 1996
- 1999
- 2002
- 2005
- 2008
- 2011
- 2015

Quantities:
- 0
- 75
- 150
- 225
- 300

The chart shows the number of anesthesiologists in pain fellowships from 1990 to 2015, with a peak in 1999 and a steady increase leading up to 2002. From 2002 onwards, the numbers remain relatively stable.
Non-Anesthesiologists in ACGME Pain Programs
Certified Pain Specialists in 2016

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesia</td>
<td>4879</td>
</tr>
<tr>
<td>PMR</td>
<td>1592</td>
</tr>
<tr>
<td>Neurology/Psychiatry</td>
<td>378</td>
</tr>
<tr>
<td>ABPM</td>
<td>3842</td>
</tr>
</tbody>
</table>
Pain Board Pass Rate

- Anesthesiologists: 89%
- Non-anesthesiologists: 92%
- Recertification: 92%
Types of Pain Programs

- Unidisciplinary
- Interdisciplinary
- Multidisciplinary
- Pain clinic
- Pain unit
- Pain center
- Syndrome-oriented
- Modality-oriented
Specialized “Pain Clinics”

- Headache Clinics
- Back Pain Clinics
- Sports Medicine Clinics
- Anesthesia Block Clinics
- Interventional Radiology Block Clinics
- Rehabilitation Clinics
- Opioid Clinics
- Mind/Body Clinics
- Physical Therapy Clinics
Other “Pain Clinics”

- Acupuncturists
- Chiropractors
- Massage Therapists
- Herbalists
- CAM Practitioners
- Yoga Practitioners
- Trainers
If all you have is a hammer, then everything starts to look like a nail.
Multidisciplinary Pain Center

- Clinical Practice, Education, Research
- Inpatient and Outpatient Components
- All Pain Complaints Treated
- Multiple Disciplines
  - Anesthesiology
  - Physical Medicine and Rehabilitation
  - Neurology
  - Psychiatry/Psychology
- Other Affiliated Disciplines
  - Orthopedic Surgery
  - Internal Medicine
  - Oncology
  - Neurosurgery
- Multiple modalities
  - Pharmacology
  - Nerve Blocks
  - Surgery
  - Acupuncture
  - Physical Therapy
  - Psychological Therapies
Survey of Pain Clinics in North Carolina

- Meet Multidisciplinary Criteria: 7%
- Freestanding: 59%
- Physician-Owned: 61%
- Anesthesiologist in practice: 54%
- Mental Health Provider in practice: 26%
- Physical Therapist in practice: 26%
- Epidural injections: 76%
- Opioid Prescriptions: 74%

Castel et al, 2009
The Future

- Decisions re funding of treatments
- Treatment by protocol
- Outcomes-based clinical guidelines