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# An Evolution of Suffering: Anesthesiology's Contribution to Pain Management

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ABSTRACT

The modern human, and all progenitor species before it, evolved in a milieu of pain and suffering. Recent innovations in medicine have permitted the development of tools to mitigate these powerful experiences. Anesthesiologists have been on the vanguard of developing treatments and systems to face this challenge. Pain is a heterogeneous entity that requires precise categorization, and targeted, multimodal treatment to optimally manage. Anesthesiologists have developed a system whereby analgesia permits a myriad of life-saving surgeries, and have expanded their role beyond the perioperative setting. This includes unique contributions to how the concept of pain is experienced by infants, and appropriate interventions in this population. Contemporary anesthesiologists have extended their responsibilities to include harnessing robust technologies to manage pain in outpatient clinics, and serving as pain experts within hospital systems. This article serves as a primer to the history of anesthesiologists' contributions to pain management.



*"Pain is a relatively objective, physical phenomenon; suffering is our psychological resistance to what happens. Events may create physical pain, but they do not in themselves create suffering. Resistance creates suffering. Stress happens when your mind resists what is... The only problem in your life is your mind's resistance to life as it unfolds." — Dan Millman*

*"Out of suffering have emerged the strongest souls; the most massive characters are seared with scars." — Kahlil Gibran*

In the mid-nineteenth century, when the science of anesthesia was an untested novelty, blind optimism collided with pragmatic safety and efficacy concerns. Both antipodes agitated the inertia of the medical establishment.[i] However, when William T. G. Morton first demonstrated diethyl ether's ability to provide pain-sparing anesthesia in that fateful 1846 Massachusetts operating theater, this new technology was quickly hailed as a godsend.[1] As vapor anesthetic was adopted across major surgical centers from New York to St. Petersburg, the more optimistic of the medical profession acclaimed this paradigm shift 'the end of human pain and suffering'.[1] The modern zeitgeist is informed by an overestimation of technologies in the short-term, and an underestimation in the long term. Over 150 years later, pain and suffering remain a perpetual reminder of our shared humanity, yet our technologies for facing this Goliath have evolved beyond the wildest machinations of our forbearers.

In the primordial days of modern anesthesia, the diffusion of knowledge regarding the utility of vapor anesthetic didn't take long to propagate, yet widespread implementation lagged behind. Between the years 1853 to 1862, 32% of all limb amputations at the Pennsylvania Hospital took place on conscious patients in excruciating agony.[1] Initial trepidations regarding anesthesia and analgesia mirror many from modernity: a fear of its inherent dangers, the notion that pain could be valuable and the inequitable allocation of resources. The constraint on anesthesia was further complicated by unscientific and often prejudiced belief systems; the notion that women, children, and whites were more sensitive to pain than their social opposites played a significant role in early pain management.[1] Anesthesiologists, therefore, have played an integral role in breaking the barriers to accessing pain management, permeating into all spheres of the patient care continuum.

Pain management has evolved beyond the operative and perioperative setting, and so too has the societal ethos regarding the acceptability of pain in medicine. Pain is no longer viewed as necessary, inevitable or character building, but rather a distinct and often treatable dimension of disease. However, the epidemiology of pain on the global scale informs a solemn picture. Despite a heterogeneity of study methods, community

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[i] Safety was far from the only issue. A large number of physicians felt that pain had some nebulously important, though not clearly defined, application in treatment.[1] Other concerns included professional power and professional etiquette.

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surveys find that 15–25% of adult populations suffer from pain at any given moment.[2] These numbers balloon to 50% in persons over 65.[2] In cancer victims, as high as 70% of patients globally suffer from disease and treatment related pain.[ii] The anesthetist has risen to the fore in rejecting the status quo, denouncing this suffering as both needless and avoidable. Acquiescing to pain is anathema to the current medical morality. Failing to act on, or refusing to accede to, reasonable requests for pain relief contravenes the autonomy of patients, and self-determination of their medical care.[2] Anesthetists, prolific in recognizing these axioms, position themselves as substantial contributors to the evolving medical bioethics.

Pain, in the medical lexicon, is classified as acute, chronic and cancer pain, and importantly sub-classified as nociceptive or non-nociceptive/neuropathic. Accurate pain triage, such as through the anesthesiologist developed DN4 neuropathic pain questionnaire, is the vital first step towards targeted treatment.[4] Unique strategies inform the management of different etiologies of the experience of pain. Anesthetists employ a veritable utility belt of techniques, medications, procedures and other accoutrement to sustain this effort. Individual interventions, often as components of multimodal treatment, include pharmacological management, physical and restorative therapy, psychological treatment, minimally invasive spinal procedures, intrathecal injections, epidural steroids, targeted blocks (nerve, nerve root and joint), ablative procedures and more.[5] The indication driven application of these interventions describe the art and science of pain management.

Contemporary pharmacologic treatment of pain has become obscured by the quagmire of scandal and negative public perception. The opiate epidemic, a public health crisis for which opiate prescribing physicians must shoulder a proportion of the blame, has been perpetuated by a lack of regulatory guidelines, physician apathy, and wonton disregard.[6–9] The quotidian doctor may prescribe opiates with limited knowledge of the trajectory of this decision, and often, the alternatives.[iii] Pain specialists have risen to face this crisis directly – physicians that advocate for an approach predicated upon accurately categorizing the etiology of pain, and targeting interventions according to the best medical evidence and jurisprudence. Anticonvulsants, tricyclic-antidepressants and SNRIs are proven first line opiate-sparring treatments for neuropathic pain.[10] Inflammatory pain, visceral and somatic, is approached with the analgesic ladder: a rigorously validated methodology which titrates medications upwards, emphasizing NSAIDs, low-potency opiates and long-acting narcotics with judicious use of breakthrough as needed.[11] Innovations in difficult-to-abuse delivery systems such as fentanyl and buprenorphine patches continue to further the frontiers of safety and efficacy. These advances have allowed pain specialists to wean patients from the horrors of opiate addiction, whilst circumventing new patients from this Faustian bargain. Though morphine and its derivatives will continue to play an invaluable and necessary role in acute pain management, the anesthetist is uniquely equipped to manage pain at this crucial watershed.[7]

The modernization of Acute Pain Service (APS) by Ready et al. has become the cornerstone of pain management in hospitalized populations.[12] Working off the assumption that anesthesiologists were uniquely poised to ameliorate patient suffering, this group developed a multidisciplinary approach to point-of-care pain services. Ready's reasoning stems from the training and skills necessitated by anesthesia formation: advanced knowledge of analgesic pharmacology that bridges operative to post-operative care, medication side-effect profiles, physiologic and maladaptive pain pathways, and technical skill with blocks and epidurals.[12] APS has facilitated the widespread adoption of Patient Controlled Analgesia as well as pre and post-surgical Epidural Opiate Analgesia. These services are utilized by multitudes of orthopedic, gynecological, general surgery and thoracic surgery patients, inclusively.[12] Anesthetists have emerged as global leaders in the continued innovation of APS.

Pain is not monopolized by the old. The proliferation of neonatal and infant surgery has only been enabled by concordant advances in anesthesia. However, neonatal physiology is such that infants are exponentially more susceptible to potentially deadly side effects of analgesics and anesthetics. It is in this context that Jackson-Rees helped establish the Liverpool technique for partial and titrated pediatric anesthesia, "A 50% mixture of nitrous oxide and oxygen, if necessary supplemented by pethidine or ether, to produce analgesia and a paralysant drug to attain relaxation and initiate control of respiration.[13]" However, abuses and misuse of this technique contributed to a culture whereby as recently as 1986, neonatal procedures were performed solely under paralysis.[14] Contention over the infant's capacity to experience pain persisted for some time, but anesthesiologists contributed to eliminating potentially inhumane practices whereby newborns, capable of robust physiologic responses to pain, were put through agony in the perioperative setting.[iv] The transition from optimizing surgical outcomes to doing what is best for the patient, a metric that prioritizes limiting pain and suffering, was stewarded by anesthesiology. Recent guidelines clearly outline, "Infants and children of all ages, including pre-mature neonates, are capable of feeling pain and require analgesia for painful procedures.[18]" However, an emergent FDA black-box warning cautioning against general anesthesia in infants, though grounded on partial and incomplete evidence, is changing the field dynamically in real-time.[v] Notwithstanding, it is the contributions of anesthetists that have given voice to protect our youngest from unnecessary barbarism at a time when they lack the capacity themselves.

The migration of pain specialist out of the operating room, and into ambulatory clinics, has revolutionized the pain management landscape. This is particularly consequential for the victims of chronic and cancer pain.[3,24] In specialized clinics, pain doctors offer a multimodal approach, combining aforementioned modalities with the advantage of follow-up and coordination with allied health professionals. Pain clinics endeavor to be an intersection between efficacious analgesics, targeted blocks and physical restorative therapies to better control refractory pain.[25] Neuroimaging research has helped to identify neurophysiological changes in brain substructures decidedly correlated with chronic pain burden. Highly specific cortical thinning in the DLPFC, VLPFC and MTL is consistent across chronic pain patients, and can be partially reversed by effective pain control.[26] Chronic pain can come to define an individual's life: a point where pain transcends the realm of the physical, becoming a pathology of the human spirit. Conservative estimates indicate that 100 million Americans suffer disability from chronic pain.[25,27] Anesthesiologists are spearheading the urgent reclamation of these overlooked patients.

Many medical professionals have contributed to the modern treatment of pain; anesthesiologists have redefined it. Pain management is

[ii] These numbers vary from 50% of patients at diagnosis, to 63% of patients with advanced stage disease. Head and neck (52%–91%), esophageal (71–77%), prostate (56%–94%) and genitourinary (40–90%) cancers are strongly correlated with pain.[2,3]

[iii] The global prescription of opiates has tripled since 1990, and the US death rate from prescription opioid overdose more than quadrupled between 1999 and 2010.[7,8]

[iv] Historically, neuroanatomists such as Fleschig and McGraw cited histological evidence of insufficiently myelinated neuronal structures in neonates as evidence of inadequate cerebral cortex sensory capacity, a view that persisted in the mainstream literature until the late 1980's.[15–17]

[v] A February 2017 perspective in NEJM validates trepidations regarding potentially hazardous effects of NMDA receptor antagonists and GABA receptor agonists in infants (particularly children less than 3 years of age of age for procedures longer than 3 h), but cautions against deferring necessary surgeries in these populations without randomized controlled trial data.[19,20] The FDA decision contradicts evidence from the GAS and PANDA studies, and its timing is suspect, as early data from the comprehensive MASK study is expected in 2017.[21–23]

not a panacea, and the science continues to evolve. However, it is the relentless contributions of anesthetists that have sustained an effort to care for this marginalized population. For the apocryphal 'no-pain, no-gain' mentality is being usurped by the wisdom of George Carlin, "My philosophy: no pain… no pain".

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