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Commentary

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Healthcare Big Data and Pain Management: A Look into the Epidemic

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Healthcare is a complex combination of system engineering and clinical science which includes many aspects of care and numerous types of professionals, including clinical providers, information technologists, data scientists, insurance professionals, pharmacists, etc. Clinical care in system engineering should be evidence-based and have a wide research base to ensure quality care. Medical professionals, patients, technologies, insurance, policies and standards, etc. ensure quality care in system healthcare engineering. Currently, Big Data analytics help form healthcare systems, policies and procedures, treatments and assessments, and achieve better outcomes, also leading innovation and research to strengthen evidence-based medicine. Neuroscience is one are today that patients are finding it necessary to expect personalized treatment and an evidence-based plan of care due to the complications associated today with opioid use and chronic pain management.

Acute and chronic pain management spending is reaching heights never expected. The use of opioids has become so rampant that even adolescents are using prescription narcotics for pain relief. Overwhelmingly, at the top of the list for behavioral problems today is opioid overdose, now a severe problem in the US as addiction becomes a primary factor in treating behavioral problems. Currently our emergency providers need education and access to medications such as Narcan, which is an antidote for opioid overdose and reverses the effects to instantly reduce the symptoms and sequelae associated with opioid use [1]. Using Big Data analytics, providers can manage the massive amounts of data associated with acute and chronic pain management such as -omics, sensor data, smartphone data, social media data, clinical data, family and patient history, etc. Chronic and acute pain treatment now dominates primary care, specialty care, and emergency departments nationwide. Our providers are becoming increasingly overwhelmed by the number of patients with chronic pain; clinics and emergency departments nationwide are just unprepared to deal with the sheer number of complaints and complications related to opioid use.

Unfortunately, self-medication has become a toxic problem among many age groups, including teens, young adults, and even middle-aged adults of both sexes who self-medicate with friends' and family members' narcotics, leaving too many patients with fatal or near-fatal opioid intoxication. Also, chronic pain treatment has reached an all-

time high but the use of narcotics on a regular basis for chronic pain results in a high number of drug addiction problems, as well as many unforeseen clinical side effects such as constipation, respiratory problems, etc. [2]. Healthcare providers in all clinical areas should receive special training and should recognize the problems associated with pain management as these patients require extensive time and understanding.

Social media has become an excellent resource for providers as well as patients, as individuals suffering from pain often turn to one of the numerous outlets such as Facebook, Twitter, Instagram, etc. as an outlet for expressing feelings related to pain management, such as pain, pain relief, what works, what doesn't work, and side effects. Other important resources include smartphone apps, sensors, wristbands, etc. which can help document symptoms and side effects to help providers with treatment [3]. It is also important for society to come to an understanding of the complex intricacies associated with pain and pain management. Pain management treatment options can not only lead to overuse, misuse, and addiction; overdose, fatalities, and long-term disabilities can result from narcotic use as well as family problems, loss of relationships, financial, and other psychological problems. Nurses and physicians must also consider another crucial factor: their own attitudes about patients with pain. Many patients develop a "frequent-flyer" reputation, or worse, a "drug seeker" reputation when they do not get adequate treatment for pain and use the emergency department for intermittent pain relief. Many emergency providers do not like to prescribe or even medicate patients with opioids due to the much legality associated with the drugs. Patients who present in primary care are likely to receive more compassionate treatment than patients who present in the emergency department due to healthcare provider perceptions of seeking treatment for chronic pain in the emergency department of clinic. Long-term use of narcotics can also result in serious side-effects such as constipation, sleepiness, disability, depression, anxiety, etc. Public health has been seriously affected by the long-term use of opioids.

Modern data registries, created to take advantage of the use of EHR systems, are all wanting data to move directly from the medical record to the databank, without requiring human construct. The problem with this model is the heterogeneity of today's electronic data. A few elements, such as vital signs and medication doses, are relatively standard from one EHR system to another, but other essentials, such as outcomes and complications, are deficient in consistent definitions across practices and software vendors. There are several types of

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questions that cannot be asked using single datasets that are supported by the availability of large shared datasets [4]. In standard cognitive neuroscience studies, one generally uses a manipulation within a single task to identify the neural systems that are putatively involved in the manipulated mental process. This approach has resulted in the association of several brain regions with a varied range of mental processes; for example, the anterior cingulate cortex has been associated with mental processes as diverse as pain, speech, cognitive control and tongue movement. An alternative method, which has the potential to provide more selective structure-function associations, is to examine the underlying neural components that span across multiple task manipulations. Therefore, data science in an atmosphere of healthcare systems engineering will have far-reaching consequences such as transferring data from one EHR system to another easily, data mining for history of both patient and family, examining vital signs, complaint data, etc. This ease of data access will allow the clinician to become an expert on the patient's needs and status. For example, for a patient taking narcotics, if the patient travels from one doctor to another in various states, data mining can produce quick results and indicate fraudulent activity and prevent serious side-effects from overdose.

One of the most relevant discoveries about data is that as more data becomes accessible to computer algorithms, predictions can be made with greater precision. Research into the field of machine learning for natural language has found that statistical machine translation and

statistical speech recognition have become much more precise as more and more data have become available. Opioid use is at a crisis level in the United States. Providers need a clinical weapon that will wipe out the far-reaching toxic effects of this serious and potentially fatal epidemic. With data mining, the use of Big Data analytics, so much information can be at the clinician's fingertip at any time.

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