

The Back Pain Consortium (BACPAC) Research Program: Cover

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Back pain is common, debilitating, and frequently cited as a contributing factor by those with opioid use disorder. Research to improve outcomes for those with chronic back pain is an important need, both in itself and as part of our efforts to combat the current national crisis in deaths from opioid overdose. For these reasons, the Back Pain Consortium (BACPAC) Research Program was launched as part of the NIH's Helping to End Addiction Long-TermSM Initiative, or NIH HEAL InitiativeSM.

BACPAC is designed to take a comprehensive approach to understanding and treating back pain. This includes studies at a discovery level that will improve our understanding of mechanisms of back pain, with the goal of developing a theoretical model that incorporates all the key contributors. At the translational level, BACPAC is supporting development of new technologies that can be used to understand or treat back pain, such as sensors or virtual reality headsets, which are now moving into clinical testing. Finally, the consortium-wide clinical study, the Biomarkers for Evaluating Spine Treatments Trial (BEST), is designed not only to determine whether one or another intervention is better overall, but to match patients, on the basis of their phenotypes and psychosocial contexts, to the best treatment for them, including sequential or additive interventions.

This issue of Pain Medicine contains important information on all these efforts. We, as representatives of the National Institute of Arthritis and Musculoskeletal and Skin Diseases, the lead institute for BACPAC, thank the staff from the National Institute of Arthritis and Musculoskeletal and Skin Diseases and the other institutes, centers, and offices (National Institute on Aging, National Institute of Child Health and Human Development, National Institute on Drug Abuse, National Institute of Mental Health, National Institute of Neurological Disorders and Stroke, National Institute of Nursing Research, National Institute on Minority Health and Disparities, National Center for Complementary and Integrative Health, Office of Behavioral and Social Sciences Research, and Office of Research on Women's Health) that have joined in this effort. We especially salute all the investigators who have worked diligently and cooperatively to move research in back pain forward. The project held together despite the COVID-19 pandemic, largely through the efforts of the investigators to maintain lines of communication. The landscape has also shifted, with a new

appreciation of the impact of social determinants of health and health inequities on outcomes, particularly with chronic pain conditions such as chronic low back pain. The impact of the pandemic on worsening mental health and opioid-related deaths has also focused attention on the links between these issues and pain. The investigators have worked to factor these into the theoretical model and to emphasize the need for, and seek funding to support, recruitment of a diverse population for the BEST trial. Meeting these challenges takes a team!

In short, the impetus driving BACPAC is this rare opportunity to take an integrated approach to tackle an important clinical problem where, through the usual funding channels, progress has been modest. The theoretical model makes the need for this approach obvious. Just the local structures are complicated enough: discs, facet joints, ligaments and tendons, muscles and fascia, etc. Each of these has blood vessels and, particularly with degenerative changes, nerves. We now recognize that the dorsal root ganglia change with pain, and we appreciate the profound secondary processing changes in the brain. Thus, just to understand the physiological mechanisms of pain, we need specialists in all these domains to work together. Of course, though, the story is yet more complicated, as many other characteristics of the individual contribute to the mechanics of the back and the experience of pain, as do environmental exposures and social determinants of health. It is unlikely that intervening at only one level will be sufficient to reduce pain in most individuals. We have to take a holistic view and bring together the expertise from many disciplines to tackle the question of which interventions at which levels are needed for which patients. To this end, the participants enrolled in cohorts throughout BACPAC undergo extensive and deep patient phenotyping, with common data elements used across the various BACPAC projects where possible. This expansive, harmonized data collection will help investigators develop a better understanding of subpopulations of patients with back pain with similar phenotypic groupings, which will be the first step toward personalized interventions.

BACPAC will deliver new tools (e.g., sensors) and new interventions (e.g., virtual reality). The theoretical model will start to quantify, where data are available, how the different characteristics of individual patients impact the pain they experience, and it will indicate where more data are needed. The BEST trial will, we hope, start the process of defining

which patients respond to which therapies, including combinations of therapies, and establish that a clinician can use the information at hand to prescribe the interventions that are most likely to help that individual. At the conclusion of all the studies in BACPAC, we should have more than 2,000 patients with chronic low back pain characterized to an unprecedented level, with harmonized measures, metadata, and common data elements, and all the data will be available in HEAL repositories. We hope the broader researcher community will take advantage of this resource to answer additional questions.

Where do we go from here? We will have to consider the spine as a biological structure with many components, all of which can contribute to pain, whether that pain stems directly from the spine itself or from forces elsewhere in the body. We will have to consider the individual holistically, with all the endogenous and exogenous factors that modulate pain. We will have to identify those areas of the model of the interactions of all the aforementioned factors for which current data are insufficient to measure their impact. These efforts are needed to find new ways to intervene in patients with back pain and to define which interventions work best for whom. Finally, we will need to continue to bring together those from many different fields in medicine, radiology, and engineering. BACPAC is a fantastic start. The cooperation across specialties and institutions is wonderful. Solving back pain will require the continued efforts of such cooperating communities. We don't know what the future of HEAL will be, but

BACPAC has been an enormous success in creating such a community. We hope that this legacy of BACPAC will invigorate and reinforce the drive to find better ways to improve the lives of those with back pain.

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