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EDITORIAL

A Call to Action: Elevating Critical Appraisal Training in Pain Medicine

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Introduction

Critical appraisal is a core competency in evidence-based medicine, yet it remains underemphasized in chronic pain fellowship training. While current fellowship requirements include participation in scholarly activities, these experiences do not necessarily equip trainees with the skills necessary to rigorously evaluate *existing* literature. This gap is especially concerning as the field of pain medicine continues to evolve, with a growing array of emerging therapies, technologies, and interventions that require careful evidence-based scrutiny. As the pace of innovation accelerates, it is imperative that pain fellowship programs incorporate structured, skills-based education in research appraisal.

The absence of formal training in critical appraisal can influence how clinicians interpret medical literature. In a 2013 letter published in the *American Medical Association (AMA) Journal of Ethics*, Martha Carvour, MD, PhD, describes two heuristics, which clinicians may unconsciously adopt. The first, "convenient appraisal", involves accepting study outcomes at face value. The second, "cynical appraisal", entails dismissing all evidence due to a perceived ubiquity of bias in all research.[1] Without structured, ongoing training, clinicians may default to these cognitive shortcuts. Such simplistic approaches risk misapplying treatments, at best resulting in ineffective care and wasted resources, and at worst causing patient harm.

If left unaddressed, this gap will continue to hinder progress in the field. This editorial calls for renewed attention to critical appraisal training to better prepare chronic pain fellows for the demands of modern, evidence-informed clinical practice.

The Current Landscape

While national accrediting bodies recognize the importance of scholarly engagement, current guidelines often emphasize research participation without ensuring a foundation in critical appraisal. According to the Accreditation Council for Graduate Medical Education (ACGME) guidelines for pain fellowship programs, all fellows must complete a scholarly project, with results disseminated through avenues such as publication or presentation at professional meetings. Fellows are also expected to demonstrate competence in general knowledge, research methodology, and ethics, including the ability to design, report, and interpret clinical trials related to pain treatment.[2] In a closely related field, the 2011 guidelines for the Regional Anesthesiology and Acute Pain Medicine (RAAPM) fellowship emphasize mentored research participation as an aspect of the Scholarly Activities/Practice-Based Learning section. This includes conducting research, coauthoring publications, and developing clinical research proposals with institutional review board (IRB) approval. The 2014 update reinforced these expectations, further encouraging fellows to engage in mentored research with structured guidance in proposal development, research methodology, and authorship practices. Yet, despite this emphasis on research activity, a critical distinction is often overlooked: engaging in research is not the same as being trained to

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rigorously evaluate it. In a survey assessing fellowship outcomes, approximately one-quarter of respondents reported that their training did not adequately prepare them to critically appraise the literature.[3]

Recent efforts have increasingly emphasized familiarity with landmark studies, but opportunities for structured training in evidence appraisal remain limited. For example, the 2023 Pain Education and Knowledge (PEAK) guidelines highlight the importance of staying current with literature by recommending that fellows read landmark studies on key pain conditions such as complex regional pain syndrome (CRPS) and failed back surgery syndrome (FBSS).[4] While the inclusion of curated reading lists represents meaningful progress, the guidelines do not yet offer a structured framework for teaching or learning critical appraisal skills. This reflects a broader pattern in the field. A recent study examining publication rates among pain medicine fellowship-trained anesthesiologists identified a positive association between fellowship training, board certification, and scholarly output.[5] However, it did not explore whether fellows were equipped with the skills necessary to critically evaluate empirical research. This underscores the ongoing focus on promoting research activity, while often neglecting the equally important competency of critical appraisal.

Consequences of the Gap

The consequences of this educational gap are not theoretical, as they have had real-world implications for pain medicine. One of the most striking examples dates back to the 1980s, and continues to resonate today. A brief, five-sentence letter published in *The New England Journal of Medicine* (NEJM) claimed that opioid addiction was "rare", despite lacking any methodological rigor whatsoever.[6] Nevertheless, it was cited 608 times through 2017, with 439 of these citations treating it as substantive evidence.[7] The data, collected retrospectively by the Boston Collaborative Drug Surveillance and limited to hospitalized patients only, did not reflect broader outpatient or chronic opioid therapy populations.[8,9] Recognizing its influence, NEJM now includes an Editor's Note cautioning that "… this letter has been 'heavily and uncritically cited' as evidence … " Although its precise impact is difficult to quantify, it clearly contributed to downstream prescribing practices. During the prescription opioid crisis, overprescribing physicians claimed that the letter provided them with evidence supporting their often irresponsible prescribing practices, and certain pharmaceutical companies cited the letter's claimed prescription opioid addiction rate of well less than 1% in their nefarious marketing of what proved to be too-often deadly drugs.[10] This case illustrates how a lack of critical appraisal, both at the time of publication and in its continued citation, can perpetuate deeply flawed narratives in pain medicine.

A 2017 Cochrane review underscores the stakes, finding that industry-sponsored studies are more likely to report favorable outcomes than independent research.[11] Without the skills to assess study design, interpret findings, or detect bias, clinicians may adopt flawed treatments, alter prescribing behaviors, or choose procedures based on poor-quality data, ultimately compromising patient care.

Although critical appraisal is often framed around statistical knowledge, much more is involved. Study design, patient population, definitions, inclusion and exclusion criteria, control-group comparability, and outcome measurement are all equally essential. That said, statistical literacy remains a significant challenge. In 2024, 27.6% of graduating medical doctors rated their training in biostatistics and epidemiology for clinical preparedness to be fair to poor.[12,13] This shortfall is evident in practice. An analysis of 277 internal medicine residents from 11 programs yielded an average score of just 41.4% correct on a test of knowledge of common statistical tests.[14] A 2020 survey of 178 orthopedic trainees in *The Journal of Bone & Joint Surgery* revealed that 83% were unable to interpret odds ratios, only 69% understood *p*-values, and 38% could not successfully apply sensitivity and specificity.[15] As the medical literature becomes increasingly complex, these knowledge gaps are cause for concern.

Recent Momentum and Opportunities

A 2023 editorial by Wahezi et al emphasized the need to strengthen research education in academic pain fellowships, stating that "pain fellowships may improve faculty and trainee understanding of research design". They stressed that trainees should gain experience evaluating or designing research as a core component of their fellowship education. The authors also raised concerns that most graduating fellows are not adequately prepared to conduct high-quality research, noting that standard compliance training such as Collaborative Institutional Training Initiative (CITI) or Good Clinical

Practice (GCP) is insufficient. Instead, they called for deliberate instruction in recognizing bias and evaluating study design, as well as skills essential for producing and interpreting rigorous research.[16]

In response, Glinka Przybysz et al echoed the need for improved research training but cautioned against over-reliance on industry-sponsored pathways. They argued that the ability to critically appraise literature and practice evidence-based medicine should not depend on access to industry-funded research opportunities. Rather, they posited that academic programs should take ownership of developing these foundational skills, thus ensuring that all trainees, regardless of research setting, graduate with the analytic tools necessary for independent, evidence-informed clinical practice.[17]

Together, these perspectives reflect growing consensus: the field must move beyond passive exposure to research and toward structured, skills-based critical appraisal training.

What Needs to Change

To meaningfully prepare trainees for modern, evidence-informed practice, programs should consider deliberate steps to embed critical appraisal into the core of fellowship education. This requires structured curricula that go beyond general research exposure and explicitly target core competencies in evidence evaluation. Foundational topics should include study design, identification of bias, confounding variables, appropriate comparator groups, and statistical literacy. Didactic sessions should be paired with applied learning, in which trainees analyze real-world studies to assess methodology, evaluate validity, and identify limitations.

Trainees should regularly engage in case-based learning that simulates clinical decision-making. For example, fellows could review a newly published interventional study during a journal club and explore its implications through a hypothetical patient scenario. These exercises cultivate critical thinking while reinforcing the practical relevance of evidence appraisal to everyday clinical care.

Faculty also play a key role and should model critical reading and interpretation during clinical encounters. When discussing diagnostic or treatment decisions, educators should highlight how published data, whether robust or limited, informs their reasoning. This approach reinforces that critical appraisal is not a theoretical exercise, but a foundational element of high-quality care.

Importantly, programs should decouple critical appraisal from the pressure to publish. While research productivity is valuable, the ability to read and interpret evidence thoughtfully is a distinct and equally vital skill. Training should prioritize evidence literacy, clinical reasoning, and intellectual rigor over metrics of academic output alone. In a clinical landscape in which new therapies often outpace the generation of high-level data, sound judgment rooted in critical appraisal is essential.

The Moment for Action

Fellowship represents the final and formative stage of training prior to physicians' transitions to independent practice. At this critical juncture, programs are responsible not only for refining procedural and diagnostic skills but also cultivating the intellectual discipline required for lifelong, evidence-based decision-making. Critical appraisal should be a core component of this preparation, not an optional or peripheral skill. Our trainees, as well as the patients who they treat, deserve such.

The ability to rigorously evaluate clinical research is foundational to ethical, informed, and patient-centered care. Without these skills, physicians may unknowingly adopt ineffective or harmful interventions, perpetuate low-value practices, or rely on marketing-driven narratives. In an era marked by rapid therapeutic innovation and widespread dissemination of medical information, the capacity to critically assess evidence is as important as technical competence.

Pain medicine is uniquely positioned to lead in this area. The field continues to evolve with new technologies, interventional approaches, and data that often outpace the development of unbiased formal guidelines. To meet this challenge, fellowship programs are obligated to elevate critical appraisal training as a central educational goal. By embedding structured, skills-based instruction in research evaluation, we can prepare the next generation of pain physicians to be not only skilled practitioners but also discerning interpreters of evidence, committed to delivering high-quality, responsible care.

Disclosure

Dr Michael Schatman is a senior medical advisor for Apurano Pharma, outside the submitted work. The authors report no other conflicts of interest in this work.

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