A structured classification of the types of pain research studies accessed by different health professionals involved in pain management

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Abstract

Objectives: The aim of this study was to describe the information access behaviours of clinicians involved in pain management with respect to their use of a pain evidence resource and to determine the areas of professional differences.

Methods: Users (n=258) of a free pain evidence alerting service (PAIN⁺) were enrolled in this study. The users regularly received email alerts about newly published clinical articles about pain that were pre-appraised for scientific merit and clinical relevance. A sample of up to 10 abstracts retrieved by each user were retrieved and classified using a descriptive classification system to describe the types of research, pain subtypes, interventions and outcomes that were reported in the accessed studies. Frequencies and chi-square tests were performed to compare access behaviours across professions.

Results: A total of 258 participants viewed 2311 abstracts. More than 52% of abstracts viewed were primary clinical studies; the majority (87%) addressed treatment effectiveness and were quantitative research (99.8%). The most commonly accessed clinical topic (58%) related to musculoskeletal pain and the most accessed pain type was chronic pain (76%). Drugs, injections and rehabilitation therapy were most commonly addressed in accessed intervention studies. Differences in professional focus were reflected in access: physicians/nurses accessed studies on injections (23%) and drugs (26%) and nurses accessed surgical studies, whereas other professions rarely did. Physiotherapists (PTs) and occupational therapists (OTs) preferentially accessed studies on rehabilitation. OTs and psychologists preferentially accessed the available studies on cognitive interventions; OTs accessed more ergonomic studies. Psychologists most accessed educational and psychosocial intervention studies. There were no differences in access across professions to multidisciplinary interventions.

Conclusion: While access partially reflects the content of the pain repository, professional differences in access were evident that related to the nature of the intervention, type of pain and the research design. Multidisciplinary evidence repositories may need to consider how to include and meet varied information needs.

Keywords

Evidence, information seeking, informatics, pain management, pain, acute pain

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Introduction

Evidence-based practice (EBP) involves a series of steps: asking a clinical question, searching for evidence to answer that question, appraising the evidence, application of the evidence keeping in mind the client's needs and preferences and finally, evaluating the entire process to make improvements as needed.^{1,2} A meta-analysis indicates that patients who receive evidence-based healthcare have 28% better outcomes than patients who were provided with care that is not evidence-based.³

Electronic databases are critical to evidence-based pain management as they provide access to a large pool of research studies. PubMed contains 813,598 citations and was used to perform 3.3 billion searches in 2017.^{4,5} The vastness of this resource is both a benefit and a challenge. A variety of evidence repositories and alerting services have been developed to improve awareness and potentially increase uptake of research evidence. At McMaster University, a suite of such services has been developed for different professions and practice areas. These knowledge products (http://hiru.mcmaster.ca/hiru/HIRU_McMaster_PLUS_projects.aspx) transfer the responsibility for searching and appraising literature to experts in these technical skills, and then match clinician with the best papers in their field, pushing out targeted citations with ratings of their quality and relevance by email.^{6,7} PAIN⁺ is one such targeted EBP tool (<https://plus.mcmaster.ca/painplus/>) which focuses on pushing high-quality, pre-appraised evidence on pain and its treatment.^{6,8} While some of the early push-out tools focused on professions, PAIN⁺ focuses on a specific area of management and, thus, is an inter-professional resource. Since pain is inherently a transdisciplinary concern, it forms the ideal context to look at differences in information accessing behaviours. Therefore, the purposes of this study were to describe the types of research evidence on pain accessed by health professionals and to identify whether differences occurred across professional groups.

Methods

The evidence repository (PAIN⁺)

PAIN⁺ (<https://plus.mcmaster.ca/painplus/>) is an evidence resource that continues to build and provide free access to registered users. PAIN⁺ filters studies from 110 journals, including all major pain journals that have a track record of providing a yield of high-quality studies. At the time of data collection in 2012, the PAIN⁺ database contained 2534 articles. Of those, 809 (32%) were systematic reviews/meta-analysis and 1385

(55%) were randomized controlled trials (RCTs). The basic criteria for original or review articles to be included in the database are as follows:

- In English;
- About humans;
- About topics that are important to the clinical practice of medicine, nursing, rehabilitation and other health professions, other than descriptive studies of prevalence;
- Analysis of each article consistent with the study question.

In addition, there are detailed criteria for each type of study which are described in the following link: <https://hiru.mcmaster.ca/hiru/InclusionCriteria.html>

Participants

The study recruited participants from the active arm of a randomized trial designed to evaluate push-out versus pull strategies of knowledge translation⁷ (Clinical Trial Registration No. NCT01348802). This study was approved by the McMaster University research ethics board, and all participants provided informed consent. Participants were selected if they were registered for at least for 2 months on the PAIN⁺ system and had accessed at least one article over a 16-month period (August 2011 to November 2012).

Procedure

Anonymous activity logs for clinicians who were PAIN⁺ users as part of the original randomized trial were retrieved from the PAIN⁺ system. For participants with less than 10 abstracts, the entire list of abstracts retrieved was sampled. For participants with more than 10 abstracts, a random sample of 10 abstracts was included to reflect the access behaviours of that participant.

The content of the abstracts was classified using a descriptive classification system to understand the types of research, pain subtypes, intervention and outcomes that were reported in these studies. A subset of the abstracts was classified by three authors who were blinded to each other's classification to calibrate coding definitions. After ascertaining a high level of agreement, the remaining abstracts were read and classified by a single reviewer. The abstract content was coded according to the study design, type of evidence, type of pain investigated, type of intervention and type of research paradigm. Random checking by the second author was done to verify the accuracy of the data. The classification coding that was used is as follows:

Type of evidence: meta-analysis, systemic review, narrative review, clinical practice guideline, cohort, primary clinical study, opinion/commentary/editorial and others;

Type of clinical question: description, clinical measure, prevalence, etiology, diagnosis, effectiveness, risk analysis, economic and knowledge translation;

Type of research paradigm: qualitative and quantitative;

Pain typology: it was defined as described within the individual studies, as follows:

1. *Physiological:* nociceptive (visceral, somatic), neuropathic and others;
2. *Temporal:* acute and chronic;
3. *Systemic:* musculoskeletal, neurological, psychological, respiratory and cardiovascular, gastrointestinal, genitourinary, other visceral, mixed and others;
4. *Etiological (type of health conditions):* genetic, trauma, operation, infective, neoplasm/cancer, toxic, degenerative, mechanical, dysfunctional (psychophysiological), unknown/other and psychological origin;
5. *Mechanism-based classification:* transient pain, tissue injury pain and nervous system injury pain.

The decision-making process behind including both the physiological and the mechanism-based classification was that despite them seeming to have similar categories, we wanted to acknowledge the basic difference between the two. With the physiological classification, we wanted to classify them basically into nociceptive or neuropathic. While with the mechanism-based classification, we wanted to dwell slightly deeper as to see the mechanism that led them to be classified as either nociceptive or neuropathic.

Type of interventions studied: drug/pharmacological, surgical, injections/interventional therapy, cognitive/behavioural therapy, educational, ergonomics, multidisciplinary, rehabilitation therapy, psychosocial, home programme, general/social work and others.

Type of outcomes assessed: pain scores, global assessment, return to work, return to daily activity, healthcare utilization, health status, quality of life, disability, general satisfaction, cost, pain threshold/tolerance, other physiological measures, electromyography/nerve conduction velocity (EMG/NCV), quantitative sensory testing, other sensory measures and physical performance.

Statistical analysis

SPSS version 22 (IBM Corporation, New York, NY, USA) was used to perform the analyses. Frequencies

and histograms were used to describe the data. A chi-square test was used to determine whether there were statistically significant differences across professional groups. The significance level was set at $p < 0.05$. Yates correction was done for multiple comparisons.

Results

Participants

A total of 258 participants met the eligibility criteria and were included in the study. There were 60 physicians, 60 nurses, 60 physiotherapists (PTs), 48 occupational therapists (OTs), and 30 psychologists. All together, they viewed 2311 abstracts. Physicians viewed 579 abstracts (mean = 9.65), nurses 560 abstracts (mean = 9.33), PTs 594 abstracts (mean = 9.9), OTs 371 abstracts (mean = 7.73) and psychologists 207 abstracts (mean = 6.3).

Abstract coding

Type of evidence. Overall, 52% of abstracts viewed by our participants were primary clinical studies – RCTs. This was followed by meta-analysis, which comprised 32% of all the abstracts viewed by all of our participants. Systematic reviews followed next (13%). PTs viewed more RCTs (56%) than other professions (range = 48–54%, chi-square = 159.1, $df = 4$, $p < 0.01$). OTs (34%) and nurses (34%) viewed more meta-analysis than other professionals (range = 28–33%, chi-square = 74.2, $df = 4$, $p < 0.01$). OTs (17%) viewed more systematic reviews than other professionals (range = 9–15%) (see Figure 1). Levels of evidence for studies on therapeutic intervention have been provided in Appendix 1.

Type of clinical question. The most commonly accessed type of study addressed issues of intervention effectiveness (87%). OTs viewed more articles on effectiveness (94%) than other groups (range = 81–88%, chi-square = 204.8, $df = 4$, $p < 0.01$). The next most commonly accessed clinical question was clinical measurement research (7%). PTs (10%) viewed more articles on clinical measurement than other groups (range = 0.3–7%) (see Figure 2). See Table 1 for different types of evidence and clinical questions accessed by each of the professions.

Type of research paradigms. Given the inherent mechanisms for identifying studies to include in the evidence repository, the majority of studies in the database were quantitative. Consistent with that, the majority of participants accessed quantitative studies (99.8%). Physicians (99.8%) accessed more quantitative research

Figure 1. Classification based on type of evidence.

Figure 2. Classification based on type of clinical question.

Table 1. Type of evidence and clinical questions accessed by clinicians.

Profession	Type of evidence	Type of clinical question
Physicians	Meta-analysis and RCTs	Effectiveness and clinical measurement
Nurses	Meta-analysis and RCTs	Effectiveness and clinical measurement
Physiotherapists	Meta-analysis, systematic reviews and RCTs	Effectiveness and clinical measurement
Occupational therapists	Meta-analysis, systematic reviews and RCTs	Effectiveness
Psychologists	Meta-analysis, systematic reviews and RCTs	Effectiveness and clinical measurement

RCT: randomized controlled trial.
A category was included in this table if 5% or more abstracts are classified under the category

Figure 3. Classification based on physiological characteristics of pain.

when compared to other groups (range = 98.5–99.6%, chi-square = 248.8, $df = 4$, $p < 0.00$). Only 0.2% of articles accessed were qualitative research. Psychologists (1.5%) viewed more qualitative research than other professionals (range = 0.2–0.8%). However, the differences were not statistically significant (chi-square = 2.12, $df = 4$, $p = 0.71$).

Type of pain

Physiological classification. The most common type of pain addressed in studies that were accessed by participants consisted of nociceptive pain (86.3%). Statistically significant differences were observed between the disciplines for nociceptive pain with physicians viewing slightly more abstracts in this category than other disciplines (physicians (89%), PTs (88%), psychologists (87%), OTs (86%) and nurses (80%); chi-square = 215.26, $df = 4$, $p < 0.01$) (see Figure 3).

Temporal classification. For the duration of pain, participants more frequently accessed abstracts on chronic pain (74%) versus acute pain (26%). There were statistically significant differences between the disciplines with OTs and psychologists preferentially accessing research on chronic pain (OTs (85%), psychologists (79%), PTs (75%), physicians (73%) and nurses (64%); chi-square = 150.29, $df = 4$, $p < 0.01$) (see Figure 4).

Systemic classification. Fifty-eight percent of the abstracts accessed by all professions were on pain related to the musculoskeletal system. The differences between professionals were statistically significant for musculoskeletal pain, and OTs viewed more abstracts than other disciplines (chi-square = 190, $df = 4$,

$p < 0.01$). This was followed by neurological system (nurses (18%), physiotherapists (16%), psychologists (16%), physicians (13%) and OTs (8%)). The differences were statistically significant with nurses accessing more abstracts on neurological system involvement (chi-square = 67.82, $df = 4$, $p < 0.010$) (see Figure 5).

Etiological classification. The abstracts most accessed by the participants that were classified based on pain etiology included mechanical/degenerative (33%) and dysfunctional (psychophysiological, 32%) types. There were statistically significant differences between the groups with OTs (chi-square = 95.53, $df = 4$, $p < 0.01$) accessing studies on mechanical/degenerative type to a greater extent and psychologists accessing more studies on dysfunctional type (psychophysiological) (chi-square = 68.07, $df = 4$, $p < 0.01$). Abstracts on cancer pain were retrieved more by PTs (chi-square = 13.03, $df = 4$, $p < 0.01$) (see Figure 6).

Mechanism-based classification. When classifying the abstracts based on the mechanism of injury, abstracts on tissue injury-related pain were the most common (85%) followed by nervous system involvement (6%). There were statistically significant differences between professions with physicians accessing more abstracts on nervous system damage (chi-square = 46.68, $df = 4$, $p < 0.01$) and OTs accessing more abstracts on tissue injury (chi-square = 196, $df = 4$, $p < 0.01$) (see Figure 7).

Type of interventions. Drugs (26%) and injection/intervention (23%), followed by rehabilitation therapy (20%), were the most common types of study intervention retrieved by the participants. There were statistically significant differences between the disciplines

Figure 4. Classification based on temporal characteristics of pain.

Figure 5. Classification based on body systems.

with physicians accessing more abstracts on drugs (chi-square = 95.4, $df=4$, $p < 0.01$) and nurses accessing more abstracts on injections/interventional therapy (chi-square = 198, $df=4$, $p < 0.01$). OTs followed by PTs viewed more abstracts on rehabilitation interventions (chi-square = 95, $df=4$, $p < 0.01$) (see Figure 8).

Type of outcomes. Pain scores using a visual analog scale (VAS) were the most commonly reported outcome measure (27.5%) in the studies accessed, although 66% used multiple outcome measures. PTs viewed more abstracts that used VAS as an outcome measure

(chi-square = 99, $df=4$, $p < 0.01$), while OTs viewed more abstracts with multiple outcome measures (chi-square = 126, $df=4$, $p < 0.01$) (see Figure 9).

Discussion

When provided with alerts about new pain research, different professions have different access behaviours that reflect differences in their scope of practice, referral base and professional interests. Because all the clinicians enrolled in this study were interested in pain management and were provided with the same alerts, the

Figure 6. Classification based on etiology.

Figure 7. Classification based on mechanism.

differences in access behaviours between professions can be attributed to professional differences rather than different evidentiary pools.

One of the purposes of these evidence repositories is to filter out low-quality studies. Given that low-quality studies were not available in the evidence repository, it is not surprising that low-quality studies were not accessed. However, although 87% of the studies in the repository were RCTs, systematic reviews or meta-analyses, 97% of the abstracts accessed by the professionals in the study were these study designs. This indicates a preference for higher quality research, that is, evidence syntheses over individual studies. However, we found that primary clinical studies (52%) were

more frequently accessed than meta-analysis (32%) and systematic reviews (13%). Since 55% of the articles available in PAIN⁺ are RCTs, the differential access to high-quality research was primarily with respect to systematic reviews and meta-analysis. This finding is consistent with other studies showing that evidence synthesis is preferred by clinicians over primary studies.^{9,10} Information needs and preferences of different professions have been studied before,^{11–14} and this can lead to better taxonomies or classifications of topics that would help create informatics resources to support EBP needs of clinicians.^{12,15}

A previous study identified that physicians seek high-quality studies such as systematic reviews

Figure 8. Classification based on type of interventions.

Figure 9. Classification based on types of outcomes.

and primary clinical studies, but did not include other professions in their analysis.⁹ We found statistically significant professional differences, with PTs and OTs accessing more systematic reviews and RCTs than other groups. This could be related to the evolution of rehabilitation school curriculums since an increasing number have higher degree requirements (MPT or DPT) which have often included mandatory courses on EBP. Furthermore, professional associations often strongly advocate for EBP, thus, inculcating an attitude

and behaviour of seeking high-quality evidence to answer questions at hand.¹⁶

We found that the majority of the types of clinical questions addressed by studies accessed by the participants in this study was primarily treatment effectiveness (87%) followed by clinical measurement (7%) and diagnosis (2%). This is consistent with a previous study of physicians and nurses that found that physicians mainly seek information on treatment and diagnosis, while nurses mainly sought information on

treatment.¹⁷ Another study looking into the information needs of primary care physicians found that 53% of their questions were on diagnosis and 26% were on treatment.¹¹ PTs accessed more articles on clinical measurement than other professional groups. This may reflect a stronger tradition within the physical therapy profession to develop valid and reliable outcome measures. However, it is recommended that readers should exercise caution in concluding on the reasons why different health professionals seek evidence as the scope of this study was limited to a particular period of time, and to a group of clinicians, this may not exactly represent the individual professional groups but can give us a snapshot into their evidence access behaviours.

The majority of the studies that would have been pushed out to our participants were quantitative studies. However, among the limited exposure to qualitative research, only OTs and psychologists chose to access these studies. This may reflect a stronger familiarity with the role of qualitative research in the psychology and occupational therapy disciplines or a greater focus on understanding the patient experience or context in which health occurs for these professions. This could also be a chance finding as we are under-powered. Future well-powered studies are needed to further explore the access behaviours of psychologist and occupational therapist in relation to qualitative studies. Since the methodological filters of PAIN⁺ may exclude qualitative research to a greater extent than quantitative research, this might be a concern for professionals who highly value this type of research.

In the current study, we found that abstracts on pain related to musculoskeletal conditions were most often accessed. According to a report by the World Health Organization, musculoskeletal conditions are the most common cause of long-term pain and disability, affecting hundreds of millions across the globe.¹⁸ This finding may reflect both the evidentiary pool and the prevalence of musculoskeletal conditions in the case-loads of the professions studied. Psychologists were least likely to access studies related to the musculoskeletal system (20%), which may reflect the fact that psychologists do not take a disease-specific (medical) approach to supporting people with pain.¹⁹

Although our study provides a unique perspective, others have reported some similar findings in different contexts, which is indicative of the fact that nurses and physicians searched for evidence to aid in evidence-based patient care. Cogdill and colleagues found that nurse practitioners involved in primary care most frequently needed information related to drug therapy and diagnosis.²⁰ A literature review concluded that nurses and physicians look for information on diagnoses, drug(s) and treatment/therapy.¹⁷ Another study on information-seeking behaviour of physicians found

that the most common clinical questions were on diagnosis and treatment.¹³

Although professional differences were statistically significant for a number of our described access behaviours, it is noteworthy that in some cases, the differences between groups were relatively small and of questionable clinical significance. Furthermore, the data also support that there was interest across the professions in studies from different disciplinary journals and topics. These suggest that in an area like pain management where multidisciplinary care is common, clinicians are interested in cross-fertilization of knowledge. This also indicates a potential benefit of an evidence repository that is focused on a clinical area rather than a discipline.

The most common primary outcome measure that was used in the studies accessed was VAS for pain. It is unlikely that people choose to access a study based on the outcome measure studied, so this indicator primarily reflects the nature of the information provided to clinicians. The use of VAS in research aligns with the fact that the VAS is the most commonly used pain measure in clinic.²¹ However, since a visual analog or numeric pain rating is a single-item measure of pain intensity, one might argue that it provides clinicians with a limited perspective on pain.

This study provides unique information on the research access behaviours of clinicians interested in managing pain. The strengths of the current study are that use of PAIN⁺ provided a level of control over the exposure, random quality checks were performed to ensure data quality and that the topic was of shared interest between different professions. However, results must be considered in light of the study limitations. These included classification error, which was not determined for the entire sample. The other issue we ran into is our inability to layer some of the results due to lack of comparator data. For example, we could not exactly determine the overall proportion of qualitative studies and quantitative studies in the database due to some technical constraints. This prevented us from determining whether the access behaviour of clinicians accessing more quantitative studies than qualitative was because of interest or because of what was available in the database.

Since the access preferences were limited to the types of studies included in the PAIN⁺ platform, our findings may not reflect the actual preferences of the participants. We can only determine what participants accessed and not what they read or applied to their daily practice. Access may not be a useful surrogate for use in practice. Our subgroups were not evenly distributed across professional groups which affected the power of subgroup comparisons. Since we do not know the clinically relevant differences in these behaviours, it

is difficult to ascribe the level of importance to the differences we observed.

In conclusion, users demonstrated an interest in accessing pain research through an alerting service. We found that clinicians who received email alerts from PAIN⁺ on pain-related research retrieved abstracts that were of high quality on the effectiveness of drugs, injections and rehabilitation, and often related to chronic musculoskeletal pain conditions. While the nature of the accessed studies was partially related to the available studies within the database, professional differences in access were evident that related to the nature of the intervention, type of pain and research design. These differences were partially explained by the scope of practice. Evidence repositories intended for different professional groups may need to consider how to include their varied information needs in the filtering, coding and evaluation of study quality.

The implications of the current study include the need for evidence repositories to be focussed on a clinical area rather than a discipline, keeping in mind the evolving multidisciplinary nature of management of pain. Also, the insight that this study has provided on the evidence search preferences of different health professions can help in creating better taxonomies or classifications of topics that would help create informatics resources to support EBP needs of clinicians involved in pain management.

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Author contributions

V.A. is the primary author and contributed to study design, data classification, data analysis and wrote manuscript; J.C.M.D. contributed to study design, data classification, data analysis and reviewed manuscript; R.G. reviewed manuscript; and Z.U. helped with data classification and reviewed manuscript.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Ethical approval

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Informed consent

All participants provided informed consent.

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Appendix 1

Levels of evidence for studies on therapeutic intervention.

	Type of evidence
1A	Systematic review (with homogeneity) of RCTs
1B	Individual RCT (with narrow confidence intervals)
1C	All or none study
2A	Systematic review (with homogeneity) of cohort studies
2B	Individual cohort study (including low-quality RCT, for example, <80% follow-up)
2C	'Outcomes' research; ecological studies
3A	Systematic review (with homogeneity) of case-control studies
3B	Individual case-control study
4	Case series (poor-quality cohort and case-control studies)
5	Expert opinion without explicit critical appraisal or based on physiology bench research or 'first principles'

Source: OCEBM Levels of Evidence Working Group. 'The Oxford Levels of Evidence 2'. Oxford Centre for Evidence-Based Medicine (<https://www.cebm.net/index.aspx?o=5653>).

RCT: randomized controlled trial.

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