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Behavioral medicine perspectives on the design of health information technology to improve decision-making, guideline adherence, and care coordination in chronic pain management

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doi: 10.1007/s13142-011-0022-6

ABSTRACT

Development of clinical decision support systems (CDSs) has tended to focus on facilitating medication management. An understanding of behavioral medicine perspectives on the usefulness of a CDS for patient care can expand CDSs to improve management of chronic disease. The purpose of this study is to explore feedback from behavioral medicine providers regarding the potential for CDSs to improve decision-making, care coordination, and guideline adherence in pain management. Qualitative methods were used to analyze semi-structured interview responses from behavioral medicine stakeholders following demonstration of an existing CDS for opioid prescribing, ATHENA-OT. Participants suggested that a CDS could assist with decision-making by educating providers, providing recommendations about behavioral therapy, facilitating risk assessment, and improving referral decisions. They suggested that a CDS could improve care coordination by facilitating division of workload, improving patient education, and increasing consideration and knowledge of options in other disciplines. Clinical decision support systems are promising tools for improving behavioral medicine care for chronic pain.

KEYWORDS

Clinical decision support systems, Chronic pain, Opiates, Behavioral medicine, Medication management

Implications

Practice: Behavioral medicine providers indicated that a clinical decision support system could be used across disciplines to promote effective decision-making, care coordination, and adherence to clinical practice guidelines.

Policy: Computerized clinical decision support systems provide a well-accepted and promising platform for interventions to improve patient-tailored use of evidence-based therapies and should be considered in quality improvement planning.

Research: The next phase of research and development should focus on adaptation of the clinical decision support system for use by behavioral medicine professionals as well as modification of factors critical to successful implementation in clinical settings.

Computer-based point-of-care clinical decision support systems (CDSs) show promise for improving clinical decision-making, evidence-based guideline adherence, care coordination across providers and disciplines, as well as patient education and communication [1]. To date, development of CDSs has focused primarily on medication management and targeted physicians and nurses even though they have the potential to be used across multiple disciplines. The expansion of CDS technology to include use by collaborative teams, including individuals from psychology, social work, pharmacy, functional rehabilitation, and other specialty providers, may better address system-level barriers to delivering coordinated patient-centered care. For example, a CDS could facilitate communication across clinics or disciplines during treatment planning, patient education, and follow-up, or educate providers in one discipline about care being provided by a clinician in another discipline and its implications for broader care decisions.

Chronic pain is a highly prevalent condition [2] and pain management benefits from collaborative work across disciplines. The predominant model for pain management is the biopsychosocial model, and interdisciplinary collaboration has emerged as the standard of care for complex chronic pain conditions [3]. This approach improves functional recovery [4], is more cost-effective than a modality-oriented approach [5, 6], and reduces the likelihood that treatments for pain will inadvertently exacerbate co-morbid disorders or increase medical or mental health risks such as overdose, addiction, or suicide [7]. Behavioral medicine practitioners have one of the larger roles in this approach, as patients with pain frequently have comorbid psychiatric diagnoses [8], and psychological factors are generally the best predictors of whether acute pain progresses to

Published online: 11 February 2011

a chronic problem [9]. Cognitive-behavioral therapies are among the most evidence-based treatments for chronic pain [10, 11], and monitoring of behavioral and functional outcomes is a key element of recommended care practices [12]. Behavioral medicine professionals are also adept at handling a range of concerns at various stages of treatment, including treatment adherence, management of treatment side effects, and lifestyle changes that would improve functional recovery in chronic pain patients.

Opiates are being used at an increasing rate in the United States [13] despite concerns about patient safety and misuse [14]. Most medical settings do not have the type of integrated care necessary to effectively treat patients with chronic pain, and primary care physicians (PCPs) are frequently relied upon for pain management [15]. Physician's beliefs and attitudes, including the perception that they have been inadequately trained to treat patients with chronic pain [16], may lead providers' to be reluctant to prescribe opiates for patients who could benefit from them. Conversely, the patients who are receiving opiates may not be prescribed in an optimally safe and effective manner, as PCPs may not be able to conduct the in-depth biopsychosocial assessment and regular follow-up needed for these patients given the limited time and competing clinical priorities in typical primary care visits.

In an attempt to promote patient safety and improve overall care for patients with chronic non-cancer pain, the Department of Defense (DoD) and the Department of Veterans Affairs (VA) developed a clinical practice guideline (CPG) in 2003 [12]. This CPG was then adapted into a point-of-care CDS, ATHENA-Opioid Therapy (ATHENA-OT), with the goal of assisting PCPs with safe and effective prescribing of opiates for chronic pain management. The CPG emphasizes that opiate therapy should be considered only after alternative treatments for chronic pain have been unsuccessful, which include pharmacological and non-pharmacological alternatives such as psychological and behavioral treatment options. The ATHENA-OT system represents not only an opportunity to prescribe opiates more safely and effectively but to encourage use of a multi-faceted chronic pain treatment plan, facilitate coordination of care across providers, improve clinical decision-making, and enhance guideline adherence.

The ATHENA-OT CDS was developed using a rigorous iterative design and evaluation process involving key stakeholders, including the authors of the CPG (2003), systems software engineers, knowledge modelers, local content experts, and opioid prescribers. The ATHENA-OT system is based on an earlier CDS, ATHENA-hypertension, which was developed to improve the management of hypertension in primary care and has been disseminated to other VA health care facilities for study in two multisite randomized control trials [17, 18]. A more comprehensive description of the development process can be found in a recent publication [19].

The ATHENA-OT CDS represents an initial attempt to use health information technology (IT) to improve clinical decision-making and adherence to CPGs for chronic opioid therapy within primary care. While ATHENA-OT was found to be generally helpful to PCPs [20], the CDS has not yet been designed for use by health professionals in other disciplines or to assist in collaborative care. Perceptions of the use of computers in a clinical setting vary across professions [21], and decision-support needs may differ depending on job function in a clinic. To design a CDS for chronic pain management that is efficient, usable in real practice settings, in line with clinical practice guidelines, and acceptable to all team members, feedback from a diverse group of stakeholders from involved disciplines is required at all phases of development and implementation. In preparation for redesign and expansion of the ATHENA-OT system, feedback about ways to enhance and improve the CDS was elicited from multiple stakeholders from various disciplines, including groups that have not historically been targeted in the development of CDSs.

Little is known about behavioral medicine professional's attitudes about the use of CDSs in clinical care despite the critical role they play in the management of chronic pain. There do not appear to be any studies that have elicited feedback from behavioral medicine providers, making it difficult to assess their interest or willingness to either use or input relevant information into a CDS. Traditionally, they have not been trained to rely on CDS technology, leading to further uncertainty about whether they would welcome the use of health IT.

In this paper, we report findings from a qualitative analysis of feedback from behavioral medicine professionals with expertise in chronic pain management regarding ways ATHENA-OT or similar CDSs could be used to improve chronic pain management. These data comprise a subsample of feedback collected as part of a broader study designed to gather ideas and suggestions for modification and improvement of the ATHENA-OT system from diverse stakeholder groups within VA in preparation for modification of the system for use in a variety of clinical settings across VA facilities. We expand the CDS literature by examining responses from behavioral medicine provider perspectives on how a future CDS, such as ATHENA-OT, could alter three domains critical to the management of chronic pain: clinical decision-making, care coordination, and guideline adherence. Because we were interested in identifying novel suggestions for improvement or expansion of the system across these domains, open-ended questions and qualitative data collection and analysis methods were used. These findings will be helpful for both designing health IT for pain management and identifying methods for using health IT to enhance the quality and effectiveness of care for prevalent conditions where behavioral medicine plays a pivotal role.

METHOD

This study was approved and overseen by the VA Palo Alto Health Care System Research and Development Committee.

Participants

For the larger study, team members identified ten professions or roles in the VA highly relevant to the management of chronic pain: primary care, pain management, polytrauma, mental health, geriatrics/extended care, nursing, women's health, pharmacy, VA national administrators, and IT. Team members created an initial pool of 126 potential participants who identified with one or more of these groups and subsequently engaged in targeted recruitment of a subsample of this pool to obtain feedback from members of each profession (see Fig. 1). Potential participants were identified based on their expertise and not on any expectation of a positive or negative response to the ATHENA-OT system. Many of these VA employees were also involved in national VA pain management and substance use disorder treatment research and policy.

Recruitment e-mails were sent to 54 potential participants, and some of these people recommended others who would be interested or invited others to participate in the study, resulting in a total of 68 individuals being invited to participate. Of these 68 individuals, 44 (65%) completed participation. Of those who did not complete participation, 22 individuals expressed an interest in the study but did not complete participation before study recruitment goals were met; only two individuals declined to participate because they did not have time.

From the sample of 44 participants, a subsample was identified who had expertise in behavioral medicine. In order to be included in this analysis, participant's work needed to reflect a consistent and continued focus on the integration of psychological and biomedical knowledge and techniques in the treatment of chronic pain.

Sixteen participants (36%) from the original sample of 44 participants were determined to have behavioral medicine expertise. They all had experience working with patients from a behavioral medicine perspective, including specific work with patients with chronic pain. These participants included ground-level clinical providers who focus on the treatment of chronic pain or behavioral management of patients receiving treatments for chronic pain, as well as administrators with significant clinical experience in chronic pain management with responsibility for making system design and policy decisions to address behavioral medicine concerns and improve care for patients with chronic pain. These participants were psychologists (n=9), pharmacists (n=3), primary care physicians (n=2), and nursing leaders (n=2). Although they are from different professional disciplines, they all have significant expertise in behavioral medicine approaches to management of chronic pain.

Participants who were not included in this study were physicians in various clinical settings (n=14), nurses (n=5), pharmacists (n=4), information tech-

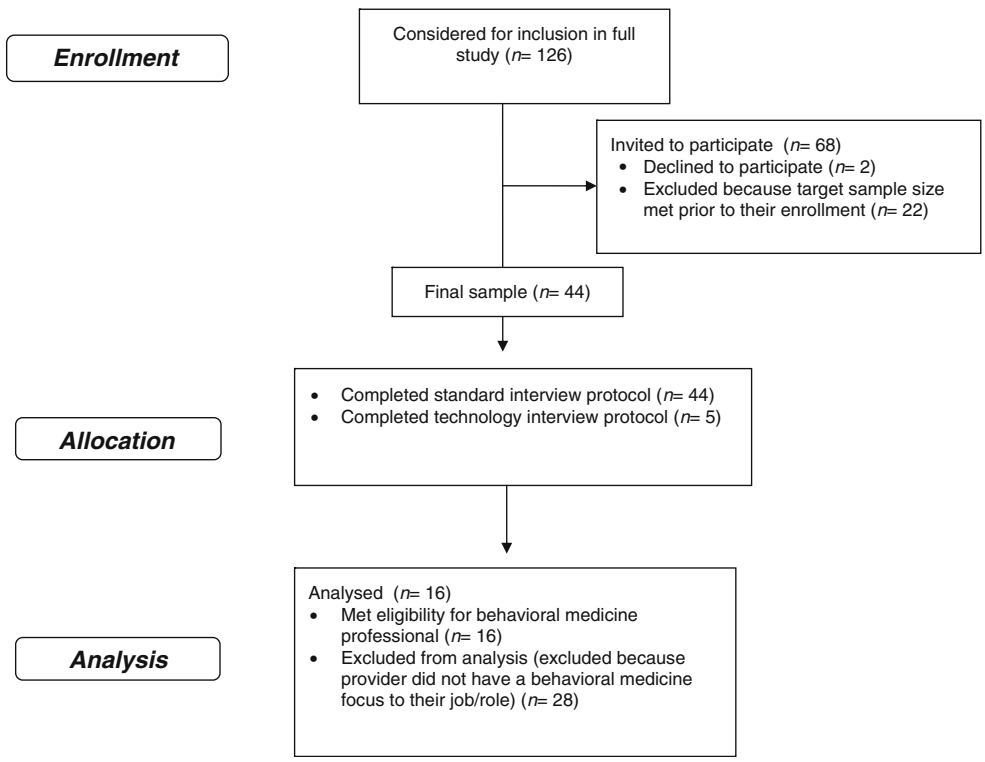

Fig 1 | CONSORT diagram

nology specialists (n=4), and a psychologist. Although they had knowledge highly relevant to the development and implementation of a CDS for chronic pain, they did not have expertise in the integration of the psychological and biomedical factors relevant to chronic pain. In this paper we will be examining the feedback and suggestions that these 16 behavioral medicine professionals made in response to a semi-structured interview following a demonstration of the ATHENA-OT system.

Procedure

Individual stakeholders who agreed to participate were scheduled for a 1.5-h session consisting of a demonstration of the ATHENA-OT system and a semi-structured interview. In one case, two individuals completed the demonstration and interview together, and their data are treated as from one interviewee. The project manager had expertise with the ATHENA-OT system and similar CDSs and conducted the sessions using a semi-structured script developed by the study team. To demonstrate the software, the stakeholder participated in an online meeting (using Microsoft Office 2007 Live Meeting software) during which the project manager shared his desktop with the participant while interacting with the ATHENA-OT system. The session was audio recorded with participant consent and synchronized with the actions on the screen during the demonstrations so that it would be clear which screen elements pertained to which comments.

The demonstration portion of the session occurred first and usually lasted 45–60 min. After explaining the goals of the study, the project manager demonstrated features of the system with a mock patient case, and the participant was encouraged to interact with the system and explore two additional test patient cases constructed for the demonstration. Participants were encouraged to ask questions and make comments throughout the demonstration.

After the demonstration, participants completed a semi-structured interview and provided feedback and suggestions about potential enhancements to the system. The semi-structured interview protocol was developed through an iterative process among team members, which was guided by a team member with expertise in interviewing and qualitative data analysis, and was intended to elicit information about how the system can be used to address chronic pain management. Before starting the semi-structured interview, the project coordinator provided a recap of the key points of the ATHENA-OT system, which included the following: it was designed to fit into the clinical workflow of a primary care physician, is directly linked to the electronic medical record, generates patient-specific recommendations for providers to consider before prescribing or continuing on opioids, and was designed to help providers with a number of pain management tasks. These tasks include conducting assessment of patients with pain, monitoring patients on opioids both for signs of improvement and signs of opioid misuse, and documenting pain management. Participants were asked how they believed the system might be changed to be more acceptable and useful.

The interview typically took 20–30 min. In some cases, due to time constraints, participants completed the interview in a separate session from the demonstration session but under the same conditions (i.e., with the ATHENA-OT system active in a shared session). If a separate interview was scheduled, participants were reminded of the key features of the ATHENA-OT system at the beginning of the interview, and any remaining questions they had about the system were addressed. The longest duration between the demonstration and interview portions of the session was 14 days, and none of the participants indicated that they had difficulty remembering the demonstration portion.

All participants answered a set of core open-ended questions; however, because stakeholders from a range of professions and roles participated, some participants were asked specific questions that were appropriate for their role and expertise. For example, only participants who worked primarily in information technology were asked questions about technical aspects of the CDS architecture.

Data analysis methods

To analyze the interview data, study team members listened to the interview recording and entered participants' responses into a database structured by interview protocol question. Participant responses were recorded in sufficient detail to capture all elements of their comments but did not constitute a word for word transcript. A study team member with behavioral medicine expertise checked the recordings and updated the entered data to ensure that answers were captured completely and accurately.

To better understand the perspective of behavioral medicine professionals on using a CDS system to manage chronic pain patients, we focused on examining participants' perspectives about the use of a point-of-care CDS system for three purposes: (1) clinical decision-making, (2) care coordination, and (3) adherence to clinical practice guideline recommendations. The interview protocol questions that generated comments most relevant to these domains were identified, and the responses from participants were examined separately (Table 1). Questions that were not included in this analysis were either not asked of these stakeholders or were not relevant for this analysis. The latter questions addressed what participants liked least and best about the system, as well as questions about whether they were aware of similar systems in other settings. The former were questions about implementation

Table 1 | Relevant ATHENA-OT questions

Question number	Question
4	The ATHENA-OT system was designed for primary care providers managing patients who are on opioid therapy or who might benefit from it. But the system could be used to accomplish other related goals. What goals do you think it is best suited to accomplishing? (Examples provided upon request)
6	What additional features or tools would you most like to have in ATHENA-OT? (Examples provided upon request)
7i	We're interested in your opinion about a number of different ways that ATHENA-OT could be modified in the future. First, there are a variety of ways that the content offered to providers in ATHENA-OT could be expanded. Do you think that adding more content about opioids is something ATHENA-OT should pursue?
7ii	Another modification would create different main pages for ATHENA-OT tailored to different types of providers or different roles in the pain management process. Do you think tailoring the system to different providers is something ATHENA-OT should pursue?
7iii	A final potential modification would be expanding the system to provide recommendations for general non-opioid pain management as well. Do you think adding more content about non-opioid pain management is something ATHENA-OT should pursue?
Introduction to 8	The "stepped care" model emphasizes managing most pain conditions in primary care, supported by access to pain medicine, behavioral health, rehabilitation, and other services. The goal of stepped care is to provide a continuum of effective treatment to patients whose pain ranges from acute pain caused by injuries or diseases to chronic pain conditions that may persist for months or years.
8i	How well do you think ATHENA-OT could help providers follow a stepped care model?
8ii	How could ATHENA-OT be changed to fit better with new models of care, such as Stepped Care? What elements are most important?
9	How could ATHENA-OT help providers take on different aspects of care for patients with pain? Could ATHENA-OT facilitate breaking up the workload of caring for patients with chronic pain? (For example, providing information tailored to providers working in pain clinics, SUD clinics, and so on.)

and required more technical and organizational knowledge than could be answered by all of the participants in this study. These questions were primarily intended for information technology experts and VA administrators who were knowledgeable about these issues.

Participant comments were categorized into these three domains. Two study team members independently coded responses and resolved differences through discussion to reach consensus. When these two members were not able to reach consensus, a third member was consulted. Any responses to the selected questions that were not relevant to these three domains were not considered in these analyses. Ninety-two percent of comments that had identifiable and meaningful content could be coded into one of the three categories. The majority of the remaining 8% of comments was related to usability, such as user interface and design, while the remaining comments identified other applications for the CDS or constituted offers to provide supplementary information to the study team. Non-descript or equivocal comments such as "I guess so" to interviewer prompts, which were relatively few, were excluded.

RESULTS

A total of 175 comments were categorized into one of the three domains or themes and additional sub-themes. Most of participants' comments were related to decision-making and care coordination; few comments were made by participants regarding guideline adherence. Fifty-two percent (n=91) of comments were related to decision-making, 42% (n=74) care coordination, and 6% (n=10) guideline adherence. The average number of comments made by each participant was 11.67 (SD=4.35), with a range of 13. They were normally distributed (25th percentile=8, 50th percentile=11, 75th percentile=16).

Although most comments focused on enhancing interdisciplinary care of chronic pain management, a few comments were made about the value of the CDS for opiate prescribing safety and effectiveness. These comments are included as a separate sub-category within decision-making. Some comments within decision-making and care coordination were relevant to more than one sub-theme, and thus the totals within sub-themes do not correspond exactly to the frequency of comments within the three categories.

Decision-making

All participants made comments indicating that they perceived the CDS to be a useful educational or training tool that would facilitate decision-making in the clinical setting (n=58 comments).

Seven participants noted that it could be useful for learning more about psychological and behavioral concerns and non-opiate therapy options (n=22 comments). Ten participants indicated that the CDS could be used as a risk reduction and assessment tool (n=18 comments).

Education about psychological concerns and non-opioid treatment–Participants suggested that the CDS could be helpful for educating clinicians about subtle or complicated behavioral issues that have substantial treatment implications but are often misunderstood or misidentified by non-specialty providers. They encouraged addition of education or tools to help clinicians distinguish between addiction, dependence, and pseudoaddiction to opioids, as well as guides to understanding and addressing aberrant behaviors. For example, one participant explained this need by stating, "Some clinicians completely exaggerate in their minds how many people are displaying other medication aberrant behaviors, while others think they don't see anybody who is addicted to meds, so having this info in a standardized form would help put things into perspective. We could use a lot more data on these controversies on pain."

Participants suggested that recommendations for, and education about, behavioral therapy should be included in the system, indicating that many behavioral medicine providers see decision support for behavioral therapy as a feasible and desirable element of a decision support system. No participant suggested that behavioral therapy was too much of an "art" to be facilitated by a computerized system. Participants additionally indicated that the amount of information about non-opioid options for pain management could be expanded, especially if the CDS was tailored to other disciplines. One participant was concerned that behavioral treatment options would only be considered after a failed trial of opiates: "I would like to see a consideration of behavioral treatment options much earlier in the process."

Participants noted that the system could help remind or educate primary care providers about treatment options available through other providers. They suggested that adding more detailed behavioral health information to the CDS could increase the likelihood that behavioral treatments are considered first rather than as a secondary option. For example, one stakeholder stated, "I think that more tightly integrated treatment than 'go see a shrink' would be very helpful and possibly help precipitate a transformation in how physicians think about behavioral health and how it can be integrated into what they are already doing." Along these lines, another stakeholder commented, "what I think is missing, which is reflective of a larger systemic problem in the health care system, is that we want the providers to think of the behavioral health providers as viable, complementary, and accessible adjuncts to what they're doing. My concern is that the providers will try to use opiates; when it doesn't work, then they will think of a behavioral program."

Education about opioid treatment–A few stakeholders discussed the utility of the CDS for opiate prescribing. Two participants stated that the CDS would allow providers to feel more comfortable with prescribing opiates. One participant suggested that additional education about different classes of opioids as well as the most common interactions between opiates and other medications would be helpful.

Risk assessment and reduction tool–Participants suggested that the CDS could be used as a risk assessment and stratification tool, allowing the provider to identify psychological and medical risk factors for opiate prescribing as well as determine if a patient would require more intensive treatment. For example, one participant said, "Another thing you could have under [the] assessment [tab] is a tool to assess a patient's risk of abuse or misuse of opioids. Then, based on risk level, that [tool] can also tell whether patient can be managed safely in primary care or need specialist care." Some perceived the CDS as a useful means for increasing patient safety and reducing risk of negative outcomes. One suggested that it could be used to reduce the risk of accidental opioid overdose, and another suggested that it could be used to provide alerts about potentially dangerous drug interactions or dosing errors.

Five participants suggested that the CDS could help determine which patients need more monitoring or special care by providing expert advice or clear criteria about when referral is appropriate. One participant mentioned that the CDS could be designed to reduce inappropriate referrals by clearly specifying criteria for intensifying care, noting, "If there are a couple of specified reasons that they're being moved to the next level of care, then that would be nice to include; so that everybody knows exactly why." Another participant remarked that the CDS would help "cut down on time contacting [the] pharmacy and others for advice or assistance" and "cut down inappropriate referrals to pain clinic that could have been handled in primary care."

Other comments–One participant suggested that the CDS could help providers with execution of prescription management plans stating, "I see providers struggling with management of the next opioid prescription. Most patients will call in, but how do providers get alerted if the patients are past-due for a renewal? Some type of automated renewal alert would help (i.e., patient A is overdue for oxycodone prescription)," so that providers could investigate why the patient is past due on medication.

Two participants were concerned about whether it would be too time-consuming for providers to use the CDS in their clinics, but thought it had the potential to make interactions more efficient over time. For example, one participant noted, "It [ATHENA-OT] creates…a pattern of thought pro-

cesses for the provider that they can utilize, not just when they are using the system, but also…when they don't use the system, to think about the algorithms that they need to go through as they're trying to get these patients safely treated."

Care coordination

Participants indicated that they perceived the CDS as a potentially useful tool to improve care coordination (n=19 comments), but most of them felt alterations to the current system would need to occur before multiple disciplines could effectively use it (n=66 comments). One participant said, "It seems like it is an opioid focused tool versus a pain care focused tool", whereas another stated, "This system really does not consolidate and coordinate the care amongst providers. It's really designed for one user to go through, get some recommendations, and then implement those."

Eleven participants noted that the CDS could be useful for dividing up the workload among providers (n=30 comments), and eight participants made comments about tailoring the CDS to providers across disciplines (n=17 comments). Eleven participants discussed the possibility of the CDS for enabling greater integration of disciplines integral to the treatment of chronic pain (n=32 comments); with four of these participants specifically noting that coordination of psychological care could be improved (n=6 comments). Three participants indicated that the CDS could increase involvement of patients in the management of chronic pain (n=7 comments).

Division of workload–Most participants noted that the system would assist with care coordination simply by helping clinicians be more aware of what the patient's other providers were doing. Having all pain management information in one place inherently facilitates coordinated treatment. Participants suggested including standardized assessment instruments and noted that the use of such tools can help break up workload among providers. One participant stated, "I know of other systems where somebody does the pain assessment and then it goes to the team but then they collectively act upon the same pieces of information and they use the tool as a vehicle for communicating and coordinating the care", while another one noted, "I could see them [nurses] using this; I think it's a very useful tool for them to do the initial assessments and reassessments." Another stated simply "Adding current opioid misuse measures can help facilitate breaking up the workload."

Tailoring for different providers–While most participants thought that tailoring user interfaces for different types of providers could be useful, a small proportion did not favor tailoring at this time. One participant indicated that it "might risk compartmentalizing the clinicians when really they should be coordinated and collaborating. Also, some of the information will be repetitive and then you might get some inconsistency in data reported by different clinicians." Two participants remarked that it might not be useful and warned against putting resources into tailoring the CDS to different providers. Seven participants indicated that tailoring would be useful but changes would need to be made to the existing structure. Six of these participants suggested tailoring the system to non-physician providers, such as nurses and mental health professionals, whereas one participant noted it would be valuable to tailor the system to physicians in pain medicine. One stakeholder suggested that "perhaps tailoring it to different medical centers" would be helpful.

Integration of care across disciplines–The comments in this sub-theme were generally related to altering the system to increase awareness of other professions who would be relevant to the treatment of chronic pain as well as design the system so that relevant providers could receive notifications that a patient was receiving treatment for chronic pain. Four participants specifically stated that it could potentially increase awareness and collaboration with providers who have expertise in psychological and behavior concerns. Another participant noted that an additional tool to facilitate coordination of care would be helpful; "We need some kind of execution pathway. Once the recommendations are made and the person says I can switch agents or send a referral to some sort of behavioral management program, how can they execute on that recommendation? Is there something they could click on that could start them on a templated progress note, for example." A CDS that not only provided information about what to communicate but also helped the clinician with the actual communication process was seen as beneficial.

Patient education and participation–Three participants suggested that the CDS could be used to help educate the patient and encourage more active self-management. One suggested that patients could go to the patient web-portal to their electronic medical record and "monitor their own symptoms by seeing a graph." Another participant suggested that showing patients the information provided to the clinician for decision-making could help the patient "see that this is a general concern due to medical literature, the patient safety issues", thus helping to validate clinical suggestions that may not be initially appealing to the patient.

Guideline adherence

Participants very rarely offered suggestions for using the CDS to improve guideline adherence or considered the tool's utility in these terms. When they did, participants suggested additional tools or features that could be added to the CDS to improve guideline adherence. When one participant was asked about

whether it would be a good idea to expand opioid content, the response was, "Another thing that you might consider adding is a link to the clinical practice guidelines themselves." Another participant stated, "What would be helpful would be to come up with some type of drug info for non-formulary medications and what are the VA guidelines for consideration of use for the non-formulary medications."

DISCUSSION

Behavioral medicine professionals with expertise in chronic pain management indicated that a CDS could improve decision-making and care coordination in the treatment of chronic pain. While the CDS had many strengths in decision-making, the greatest area for improvement was in care coordination. The relatively few comments about guideline adherence across participants, despite the fact that the CDS was explicitly designed to encourage adherence to the VA/DoD clinical practice guideline for opioid therapy for chronic pain, suggests that behavioral medicine stakeholders may not spontaneously conceptualize the purpose of a CDS in terms of improving guideline adherence. However, it is important to note that the interview was likely not able to sample views on use of the CDS to promote guideline adherence; explicit questions targeting this topic appear necessary to elicit comments in this domain. Stakeholders more readily recognized and conceptualized the usefulness of a pain management CDS in terms of helping clinicians make more informed decisions and improving coordination of care across providers. Couching the utility of a CDS in terms of its benefits for clinical decision-making and care coordination when communicating with or training behavioral medicine providers may be helpful for explaining the utility and increasing the acceptance of health IT.

Perhaps one of the most promising findings is that behavioral medicine providers quickly identified the benefits of CDSs for addressing behavioral medicine issues important to effective pain management. They noted the value of the CDS for risk reduction (e.g., preventing overdose or misuse, alerts for multiple prescribers), coordinating assessments among providers, treatment planning, and documentation (e.g., referrals, patient's progress). They indicated that the CDS represents an opportunity to educate and train providers across disciplines, which is frequently noted as a barrier to effective pain management [22]. They recognized that the CDS's educational components, especially the non-opioid treatment options, could encourage medical providers to consider including psychological and behavioral treatment options earlier in the pain management process.

Strengths

The inclusion of providers with diverse professional backgrounds in behavioral medicine facilitated a greater range in the comments generated and illustrated the diversity of disciplines involved in behavioral medicine care of chronic pain. With greater recognition that the practice of behavioral medicine extends across disciplines in health care, comes greater interdisciplinary collaboration [23]. To our knowledge, this study is the first to include feedback from key behavioral medicine stakeholders in the development of a CDS for chronic pain management. Most of the CDS literature has focused largely on medical staff and neglected other important stakeholders. In the case of chronic pain, a biopsychosocial approach is critical to successful pain management [3]. Moreover, by obtaining feedback from behavioral medicine providers about the CDS during the early phases of the development of the ATHENA-OT system, we can incorporate adaptations to the CDS to fit within an interdisciplinary treatment framework. We can tailor the system to providers across disciplines based on features that stakeholders identified as useful to them while simultaneously considering how the perspectives across disciplines can be integrated into a user interface that is relevant for a range of treatment providers.

Although the ability of the CDS to increase guideline adherence did not appear to be a focus for changes to the CDS among this group of stakeholders, the system was developed with this goal in mind. Many clinicians find treatment algorithms derived from clinical practice guidelines to be confusing and time-consuming, leading clinicians to avoid using them [24]. The stakeholders in our study did not perceive the information provided in the CDS in this manner even though it was adapted from clinical practice guidelines for chronic pain management. Their feedback indicated they felt the organization of information generally facilitated decision-making. Thus, A CDS such as this one may allow clinicians to feel greater self-efficacy in their clinical decisions while adhering to clinical practice guidelines.

Limitations

While the stakeholders included in this study have expertise in clinical care as well as organizational issues in behavioral medicine, which is highly valuable to the development of a CDS for chronic pain management, they constitute a small sample and were not randomly selected, thus limiting the generalizability of their comments. Given the need for more in-depth qualitative data analysis in the early phase of CDS design, we felt that it was appropriate to begin by getting feedback from a small number of pain management experts in the VA. As the development and eventual implementation of the CDS continues, more rigorous testing, including randomized trials, will be conducted.

These findings also have limited generalizability to settings in which electronic medical record

systems are not used regularly. The VA has been using an electronic medical record system for decades. Clinicians within the VA have more experience with health IT than U.S. clinicians as a whole. However, the use of health IT outside the VA continues to expand, and other health care settings will likely benefit from CDS studies such as this one.

Future directions

The successful management of chronic pain often requires an interdisciplinary approach. The evidence indicates that it is generally more cost-effective than other approaches and results in improved functionality (e.g., employment status) and other outcomes (e.g., improved quality of life [25]). However, within some health care facilities, barriers exist to implementing an interdisciplinary approach. The development of health IT that is potentially relevant to multiple disciplines, such as a CDS for chronic pain management, is one way to reduce these barriers so that patient care and safety can be improved.

Research into the development and implementation of this CDS will continue with the goal of potentially adapting it for a range of relevant disciplines within chronic pain management. It is our hope that CDSs become a valuable tool for behavioral medicine providers to use in other clinical settings to improve the practice of evidence-based medicine. As mentioned previously, the development of this CDS for chronic pain management was based on a previous CDS developed to manage hypertension [26].

Recommendations for improving the CDS

The findings from behavioral medicine providers suggest several key areas where the ATHENA-OT system, and perhaps CDSs more generally, might be expanded to improve pain-relevant behavioral medicine in health care systems. Specifically, they suggest that ATHENA-OT could do more to (1) encourage and standardize assessment of behavioral components of treatment and treatment adherence, (2) increase understanding of and prompt use of behavioral treatment options, (3) improve behavioral risk assessment, (4) better target referral to behavioral medicine and other specialists, (5) increase use of multi-disciplinary treatment options, and (6) engage patients in their on-going care and clinical decision-making.

Encouragingly, behavioral medicine specialists provided suggestions of ways in which the CDS could improve clinical efficiency, rather than just add to care being delivered, specifically by decreasing unnecessary referrals, facilitating documentation and clinical communication, and highlighting important information. Like other providers, they highlighted the crucial importance of making the CDS fit into clinical workflow and be quick to use. One surprising finding was the frequency at which behavioral medicine specialists warned against making assumptions about or trying to systematize the roles of a given provider type within a pain management system. Discussions with primary care doctors during development had suggested that tailoring the CDS for other provider types might be helpful [20]. Behavioral medicine specialists interviewed here cautioned about making too many changes to the system for specific providers. The limits of this approach might have been more salient to our participants because they come from mixed backgrounds, often work across disciplines, and in many cases have been involved in designing local, regional, or national care delivery systems that span clinics and clinical domains. The findings of this study suggest that behavioral medicine specialists are comfortable with and see the utility of a CDS for facilitating care for chronic pain patients. They could readily identify potential problems and envision useful improvements, as well as suggest specific modifications to enhance chronic pain management using behavioral medicine techniques.

Acknowledgments: The project was funded by VA Health Services Research and Development (HSR&D) Quality Enhancement Research Initiative (QUERI) Project # RRP 09-144 (Cronkite, PI), entitled "Implementation of ATHENA-OT Decision Support: Facilitators and Barriers", VA HSR&D Project #TRX 04-402 (Trafton, PI), entitled "Decision Support for the Management of Opioid Therapy in Chronic Pain", VA HSR&D Research Enhancement Award Program (REA 08-266), Geriatrics Research Education and Clinical Center (GRECC—VA Palo Alto Health Care System), and VA Office of Academic Affiliations Advanced Fellowship in Medical Informatics (Midboe, postdoctoral fellow, VA Palo Alto Health Care System). We thank Susana Martins, PhD, Martha Michel, PhD, and Dan Wang, PhD, for their assistance in design of the interview protocol and methodology, and Sharfun Ghaus, MD, for her assistance in transcription and coding of interview responses.

Disclaimer: The views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States government.

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