



Translating research into practice through user-centered design: An application for osteoarthritis healthcare planning



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ABSTRACT

Objective: To identify the needs and requirements of the end users, to inform the development of a user-interface to translate an existing evidence-based decision support tool into a practical and usable interface for health service planning for osteoarthritis (OA) care.

Materials and Methods: We used a user-centered design (UCD) approach that emphasized the role of the end-users and is well-suited to knowledge translation (KT). The first phase used a needs assessment focus group (n = 8) and interviews (n = 5) with target users (health care planners) within a provincial health care organization. The second phase used a participatory design approach, with two small group sessions (n = 6) to explore workflow, thought processes, and needs of intended users.

Results: The needs assessment identified five design recommendations: ensuring the user-interface supports the target user group, allowing for user-directed data explorations, input parameter flexibility, clear presentation, and provision of relevant definitions. The second phase identified workflow insights from a proposed scenario. Graphs, the need for a visual overview of the data, and interactivity were key considerations to aid in meaningful use of the model and knowledge translation.

Conclusion: A UCD approach is well suited to identify health care planners' requirements when using a decision support tool to improve health service planning and management of OA. We believe this is one of the first applications to be used in planning for health service delivery. We identified specific design recommendations that will increase user acceptability and uptake of the user-interface and underlying decision support tool in practice. Our approach demonstrated how UCD can be used to enable knowledge translation.

1. Introduction

Osteoarthritis is a chronic condition that affects 4.6 million Canadians and costs the Canadian health care system billions of dollars in medical bills and lost wages each year [1,2]. Affecting 1 in 4 Canadians by 2040, this financial burden is expected to increase substantially as the population ages and obesity rates increase [3]. Long-term strategies for effective and efficient health care delivery are critical for planning sustainable services, particularly for chronic conditions like OA. However, such strategies are currently difficult to identify and prioritize.

There is a lack of decision support tools capable of concurrently revealing the effects of care process changes and population dynamics on patient outcomes, system performance, resource requirements, and the costs of care in the long-term. Without such tools, it is difficult to

anticipate the consequences of healthcare planning decisions; yet long-term planning is vital to ensure the health care system is equipped to meet the needs of future patients [4]. To address this, the project team previously developed an evidence-based simulation model to support resource planning and policy development relating to osteoarthritis health care delivery, funded by the Canadian Institute for Health Research (CIHR) operating grant [Grant #: 126128] [5]. The long-term, population-level simulation uses system dynamics to model osteoarthritis patients as they transition through the continuum of care from disease onset through end-stage care, and provides insight into the size and characteristics of the patient population, their resource requirements and associated health care costs. Estimating how many patients will require care, the nature of the care they require, and when and where they will require it, is critical when planning resources for a sustainable health care system. The model simulates the movement of

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patients through the system as they use different system resources, allowing target users (e.g., health care planners) to explore the potential effects of different planning scenarios on system performance. The aim of this study was to provide end-user input to inform the future development of a user-interface to translate an existing evidence-based decision support model into a practical and usable interface for health service planning. This paper reports on how end users (health care planners) were involved in the design process for a web-based interface tool, to facilitate the translation of the OA care decision-support model into practical use.

To maximize the effectiveness of the user-interface developed, a User-Centered Design (UCD) approach was utilised, in which target users are involved throughout the product development process [6]. This approach has successfully created effective tools that help users with their workflows and tasks. For this process, the target users are healthcare planners, and the target application domain is an evidence-based decision support tool for healthcare planners. The authors included elements of participatory design (PD), where target users, and stakeholders are invited to draw and share their own designs, co-create with software designers, or critique prototype designs in an iterative manner throughout the software design and development process [7]. Both these approaches have similarities to integrated knowledge translation (iKT), defined by the Canadian Institute for Health Research (CIHR) as “a dynamic and iterative process that includes the synthesis, dissemination and exchange of ethically sound application of knowledge, to improve the health of Canadians, provide more effective health services and products, and strengthen the health care system”. CIHR also recognize that collaborative approaches to research, such as participatory research, could also be known as iKT [8]. Creating meaningful user engagement is a cornerstone for the CIHR initiatives regarding the translation of knowledge generated from research. Knowledge translation is seen to take place in two main ways; integrated throughout the research project and ‘end of project KT’ activities, such as publication and presentations [8]. This difference is worth noting, we believe, because of the nuanced differences in user needs between a tool that supports decision making on the level of a specific workflow for specific patient treatment/diagnosis and the needs of policy planners looking to forecast and predict impact of changed policies on health care systems. In UCD, these are two very different problems with very different needs. We were unable to locate any studies that used UCD as an approach for knowledge translation and were intrigued to explore if there were similarities in their goals and concepts.

Participatory design (PD) approaches are a set of research methods through which user-centered design can be achieved. PD has been advocated as a user design approach in the development and evaluation of eHealth technologies for nearly twenty years [9–11] and yet widespread adoption of this approach remains variable. These frameworks place the user as an integral participant to the development and evaluation of the technology and avoid the “high tech-with-a-low impact” outcome [12,13]. It has been suggested that there can be wide variation in the extent of the end user involvement in health information systems; from just the design to a more integrated approach covering the planning, performance and evaluation [14].

Most examples of PD in healthcare are in specific clinical settings i.e., public health nursing [15], primary care referrals to secondary care [16–18], collaborative clinical trial protocol writing system [9], rather than health services delivery and planning. An example of PD from the UK’s National Health Service (NHS), where family practitioners and patients co-designed services together, generated significant improvements in primary care services [19]. A further example of the success of this method within the NHS was where wait times were shortened from two years to 2 weeks, by moving 24 h monitoring for electro-cardiograph, spirometry, and ambulatory blood pressure into primary care [20]. These examples focus on individual patient groups and/or practitioners but we were unable to locate any studies that have taken

a health service planning perspective.

Involving target end user groups in the design process of health care innovations such as our user-interface, through UCD, has proven successful in the creation of better decision support tools. Whilst we could find examples of its application in health, we were unable to identify any for planning healthcare delivery.

2. Objective

Our ultimate study objective was to develop a user-interface to enable us, as part of our knowledge translation strategy, to take our existing evidence based OA care decision-support model into a practical and usable user-interface tool for health service planning. To achieve this, the specific objective of this study was to identify the needs and requirements of the end-users, to inform the development of this user interface. The future development of the user-interface required us to: i) identify the needs and requirements of provincial healthcare planners (end-users) that should be addressed by the interface; ii) define end-users’ performance expectations that must be considered in the interface design; iii) specify functions critical to the design and usability of the interface; iv) identify and recommend specific technical requirements for the design of the interface; and, v) identify similar goals and concepts between UCD and iKT

3. Method and materials

3.1. Design

Phase one of our UCD approach was a needs assessment that informed a PD session (phase two), where participants were asked to consider a paper-based prototype of the user-interface [21]. The Conjoint Health Research Ethics Board at the University of Calgary granted ethics approval (#:REB14-1032) and all participants provided informed consent.

3.2. Procedures

In phase one, the needs assessment established our contextual understanding by gathering information about the end-users’ requirements and desires (e.g., their expectations about the user-interface, types of inquiries they wanted to perform, their goals regarding its use, day-to-day habits, etc.) and the organizational environment (e.g., existing or anticipated technological infrastructure) where the interface would be implemented. A focus group was chosen as the preferred data collection method as it is particularly useful to elicit discussions around a particular topic where participants can respond to the facilitator but also interact with other participants [22]. These interactions can produce new insights and ideas together, as well as a better understanding of issues [23]. It is particularly useful for developing ideas, as participants can build upon each other’s thinking and contributions [24]. A needs assessment focus group is a standard qualitative research methodology used in the early stages of software development and is one of the main data collections methods [25,26]. It is used to collect information from end-users regarding the functionality, ease of use, and barriers/catalysts to creating and implementing the interface. Typically, focus groups require between 8 to 12 participants for meaningful interaction between participants to provide sufficiently-rich data [27]. An invitation to participate in the study was sent to healthcare delivery planners and policy makers in a Canadian provincial health services’ executive team, via an email invitation. A focus group was conducted with potential users (healthcare planners and one analyst) by JB and LBL within a provincial health services’ executive team. The focus group lasted approximately an hour, and began with a round-table of introductions from the participants and the researchers, followed by a brief introduction of the topic area. Group participants (n = 8) were asked to share and discuss their thoughts around OA care planning and

decision support tools. Five supplementary telephone interviews took place with data support and analytics team members, who were unable to attend the focus group, each lasting 20–45 min. A guideline script was used to guide the focus group discussion and supplementary interviews (Appendix A).

The second phase employed a participatory design method and used two small group sessions ($n = 6$) to capture the data. In the first phase of our session, participants were asked to consider a pre-determined scenario that could affect decision-making for the provision of osteoarthritis care (i.e., “What if the BMI of the population goes up by 5%?”), and then draw/sketch/list the data elements that they felt were relevant (based on their sense of logical presentation, previous or similar technologies, or otherwise). After some minutes, participants were then asked to show us, on a paper-based screen, where they would expect to find those data elements. In the second phase of our session, participants were asked to consider a low-fidelity paper-based prototype created of the system that had been created based on the needs assessment phase. They were asked to identify what they liked, disliked, and where/how it worked or did not work with how they expected to address their tasks. This prototype considered the same pre-determined scenario and provided a realistic request for health service planners in osteoarthritis. i.e., “What if the BMI of the population goes up by 5%?”.

3.3. Analysis

The needs assessment and participatory design methods used a focus group, interviews, and small group sessions. These were digitally recorded, transcribed and thematically analyzed [28]. The process of generating the insights or the overall design recommendations came from the analysis of transcripts for the focus groups and interviews. The guiding framework for the analysis, synthesis and subsequent themes, utilised software usability design principles. These principles, for example, the eight described by Schneiderman and colleagues (2016) [29], generally incorporate usability, user experience, user needs (as described by the participants) and information visualization principles [30]. The themes reported reflect principles embedded in software usability design. The analysis was conducted by JB, who has extensive experience with user experience and design. Data in the form of notes taken during the sessions supplemented the analysis.

4. Results

4.1. Needs assessment and design recommendations (Phase one)

A total of eight (seven local and one remotely-located) participants took part in the focus group. These participants included four Directors, two Executive Directors, a member of an analytics team, and a member of a planning team within the health service organization. The Directors and Executive Directors had planning responsibilities although they were not directly called planners. The needs assessment identified five key design recommendations as described below (Table 1).

4.1.1. Know your intended users

A variety of viewpoints were expressed on the topic of who they thought would be the most likely users of the system, including primary care, those working with Geographic Information Systems integration, workplace health & wellness planners, communication departments, external planning companies, as well as health service executives within the provincial health authority:

P1: ‘Primary care, huge for sure.’

P2: ‘Yeah, I mean they do send out internal and external lots of communications and I think visuals are always a big part of that so if we can tie it into, not just a patient in front of a bill board or a facility but actually showing something live and active, I think will be really beneficial to them.’

Before the user-interface is developed, the target users should be clearly defined. We spoke to executives who likely have a good sense of the overall concept of what is needed, as well as data analysts who translate those high-level needs into research questions. The information needs of the selected target user group should be noted, as well as the context of how they might use that information. We developed personas (a fictional person that represents the needs of the users) to guide the design and development of the user-interface.

4.1.2. User-directed explorations and analysis

Most participants had experience with analysis of historical information to assess the current situation, however the user-interface is meant for future-planning and anticipating the potential impact of changes. Participants reported that information requests were often vague and they needed to support as many potential user groups as possible (e.g., analysts, healthcare planners, clinic managers, etc.). The user-interface should be created to support freely-configurable user-defined search criteria as well as provide guidance to help some users to construct their research questions within the interface. This support within the interface could allow users to explicitly select specific populations, interventions, comparisons, and visually display what the outcome of the intervention might be using appropriate visual presentations (e.g., charts, graphs, heat maps). Recognizing the varying sophistication of questions was important:

P2: ‘You know typically clients will come to us and they will say just give me all the data about this you know without actually refining it down you know what is their end goal.’

P3: ‘I would say that we have the full spectrum of sophistication of people making the requests, so we will have people who understand data and understand how to express what they are looking for all the way to the other end of people who are unaccustomed to using data and even have difficulty describing the problem that they are trying to answer.’

To support more sophisticated exploration, the user-interface should allow for full user control where desired, and information weighting (users’ needs to give priority to a certain aspect in the model e.g., cost) should be included to provide as much control to the user as possible. The user-interface should also highlight or isolate specific populations or geographical areas for consideration, or the impact of policy changes on specific geographic or cultural areas in the province clearly and visually (e.g., potentially with a map-basis).

4.1.3. Flexible inputs, saving, and sharing

The user-interface should be sufficiently flexible to incorporate all data sources as they become available and respond to changes in economic and political environments. Participants’ preferences for shared searches and collaboration suggest the need for a web-based platform that is easily accessible by a variety of users such as those using centrally managed computers without administrative access:

P: ‘Well I mean certainly and there is talk too about creating a live dashboard so you know if things are already in Tableau [visualization software producing dashboards] the idea of just having you know a live dashboard that individuals can access and you know you can drill it down by site, you can drill it down by fiscal year, quarter that sort of thing.’

This user-interface could house group-based collaborations and explorations, and provide pre-made searches for other groups to reuse. Collaboration between colleagues and between levels of government and healthcare planners should be emphasized in the user-interface.

4.1.4. Presentation of outputs

The user-interface should be able to create clear, uncomplicated,

Table 1
Design Recommendations Based on the Needs Assessment (Phase One) and the Participatory Design (Phase two).

Design Recommendations	Description
Needs Assessment (Phase One)	
1. Know Your Intended Users	Before the user-interface is developed, the target users should be clearly defined.
2. User-directed explorations and analysis	The user-interface should be created to support freely-configurable user-defined search criteria as well as provide guidance to help some users to construct their research questions within the interface.
3. Flexible inputs, saving, and sharing	The user-interface should be sufficiently flexible to incorporate all data sources as they become available and respond to changes in economic and political environments
4. Presentation of Outputs	The user-interface should be able to create clear, uncomplicated, and visually appealing outputs that can then be embedded into other presentation media.
5. Provision of definitions	The sources of data should be clearly referenced and the algorithms and means of deriving outcomes clearly communicated in the user-interface to ensure credibility and reliability of the tool and the outputs.
Participatory Design (Phase Two)	
1. Understand the current situation	Before users can explore potential “future” situations, they need a good understanding of the current situation; including historical data and reference material related to current best practices.
2. Explore ‘what if’ questions	Inclusion of a visual aid to help users identify research questions.
2. Interaction with parameters and visualizations	Once participants have selected the parameters e.g., time ranges, they want to include and create the scenario they want to simulate, and refine the visualizations for presentation purposes.
3. Documentation of the methodology	Users would like to be able to keep a record of the process they undertook to find the results.

and visually appealing outputs that can then be embedded into other presentation media such as MS PowerPoint® or print-quality images. It should therefore have the capacity to save explorations, visual outputs, as well as provide a “baseline” (i.e., make no changes) for comparisons:

P: ‘...you know strange convoluted process to try to get it into a presentation or a document if it’s a visualization, it needs to easily interface between the programs that we typically use for communicating with stakeholders and decision makers, those are a few things...’

P: ‘The preferred way is to present it as simplest as possible, I have been in my role for two and a half years and probably the most common thing I am hearing from our stakeholders is that it is too difficult to understand data reports.’

The visualizations and other outputs created by the user-interface should be clear, concise, and easy to understand.

4.1.5. Provision of definitions

The sources of data should be clearly referenced and the algorithms and means of deriving outcomes clearly communicated in the user-interface to ensure credibility and reliability of the tool and the outputs:

P: ‘I guess in the tool that you are developing – I would expect there be some definitions and definitions in laymen’s terms.’

P: ‘...The other thing that has been really important is educating them in terms of how these things are derived, so recently we have noticed that a lot of the sites you know are looking at their score cards and looking at their indicators and their seeing percentages but they are not really understanding how the indicator is being derived from the data and so we have spent some time workshops with them, educating them on the data bases briefly.’

4.2. Participatory design method (Phase two)

Two participatory design sessions (attendees of 2, and 4 respectively) were held with a provincial health services’ executive team and included 3 executive-level members, an analyst, a summer student in the planning group and a senior planner. This phase identified workflow insights from a proposed scenario, such as how participants understood the situation and key design considerations (see Table 1). It was also important to explore their understanding the current situation, exploring ‘what if’ questions, interaction with parameters and visualization, documentation of the methodology and support for interactive exploration.

4.2.1. Understand the current situation

Before users can explore potential “future” situations, they need a good understanding of the current situation; including historical data and reference material related to current best practices. The ability to demonstrate relationships between data elements they are considering is important. At the same time, a visual representation of the current situation (i.e., a time frame of 1 day with all possible parameters) provide users with a clearer sense of the present-day situation:

P2: ‘I find, because we have so many different options right now, like you said, tableau, or, sort of, the new thing in [provincial health service], we’ve been all using. And then, we, we were using SPSS SAS, and SQL TOAD like all kinds of different things, they all kind of be able to do a little bit of maybe. I don’t know if we, I have a picture of ideal tool which can accomplish everything in my daily work, I would use different tools and kind of the media to achieve different goals in the task.’

4.2.2. Explore ‘what if’ questions

Participants reported that many of the planning requests were often vague and undefined. A highly useful design feature of the user-interface would be the inclusion of a visual aid to help users identify research questions. A mind map representation was used by at least one participant in the first task and provided insight into a potential visual aid:

P1: ‘And I started to think about different other, where do these people end up in the health care systems, so GP visits related to BMI, umm, lab tests related to BMI, ED visits if there were any, umm hospitalizations, ultimately, death. Umm then I just started kind of writing down a bunch of things. So then I would want to know like, umm... you know potential diagnoses or reasons for admissions or ED visits, that are related to obesity, that also we know are more big cost-drivers of diabetes, hypertension.’

The importance of having support for interactive explorations was highlighted as participants in both sessions identified ways in which they would like to be able to interact with data and parameters as they compose their research questions. This mostly came from the frequent comment that they need to generate answerable questions from vague requests. A range of potential opportunities for interactive support such as mind maps, interactive maps, changing inputs and adjusting outputs:

P4: ‘Do it from here, at any time go to another region, go to the province, scroll down or sideways is what I would want on every move.’

P1: ‘on a screen and then clicking this, and then seeing what it is, and then going back, and clicking the next one and seeing what that looks like.’

In the second part of the participatory design sessions, participants were asked to consider and provide feedback on a paper-based prototype that the research team had created based on the feedback obtained from the needs assessment phase. The following aspects were considered important to the design of the interface.

4.2.3. Interaction with parameters and visualizations

Once participants have selected the parameters e.g., time ranges, they want to include and create the scenario they want to simulate, and refine the visualizations for presentation purposes. Desirable refinements included color-based branding (i.e., to match an existing document template’s color scheme), refinement of included and excluded categories, and re-labeling of graphs and figures. It may be outside the scope of this current tool to provide this level of interactive support, and so a clear path to export simulation outputs into other software such as MS Excel® or Tableau®, would likely provide the desired functionality:

P: ‘I’m visual, so I would like to see graphs, whether it be like a bar graph, or a pie graph, just to kind of get at the sense...’

4.2.4. Documentation of the methodology

Study participants indicated that when they explore unfamiliar data looking for interesting correlations, or receive vaguely-defined data requests, they would like to be able to keep a record of the process they undertook to find the results that they find.

P4: ‘[...] if there’s the ability to click on things as you go and compile information that at the end of it, along with the projections and modelling that it would also come up with a bit of a list of recommendations and topics that you have looked at. So maybe I’m clicking, maybe I’m looking specifically for obesity relevant to hypertension in the northern area of the province specific to a certain facility, but as I’m doing that list, it would actually give me that at the end of the day...’

P1: ‘Like would spit it out a summary’

P2: ‘yeah, of all your, sort of, your process’

P4: ‘Of my process of where I’ve narrowed it down’

P2: ‘and the information summarized’

One less-than-convenient documentation strategy is for the user to explicitly write out their process as they do it. This, however, distracts them from their target task, thereby hindering the process. Consequently, a behind-the-scenes log of a user’s exploration process that ultimately creates a human-readable log would facilitate this need without encumbering the user. This log should also include a list of data sources or references from which the results are derived.

Objective v compared components of iKT and UCD and identified where there were similar goals and concepts (Table 2)

5. Discussion

The aim of this study was provide end-user input to inform the future development of a user-interface to translate an existing evidence-based decision support model into a practical and usable interface for health service planning. The first phase gave insight into the workflow and the second phase provided more detailed workflow insights to provide an understanding of the key design considerations. The application of user-centered design will help inform the needs a user-interface to aid in the specific application of a decision support tool for osteoarthritis health services delivery and planning. We believe this is one of the first applications to be used in planning for health service delivery. Through

needs assessment and PD, we identified specific design recommendations that will increase the likelihood of user acceptability and uptake of the user-interface and underlying decision support tool in practice. The discussion around user expectations, ideas and desired features that contribute to finding a satisfactory tool, can be complemented by using tools that users already have available to them. Interestingly, the importance of design feedback, where new features not previously identified are suggested, and how users identify new ways of using the application have been reported by others using PD in clinical settings [1618]. Understanding user perspectives appears to be a critical step for translating this interface into a practical and usable user-interface for health service planning.

It was evident that user-centered design share similar goals and concepts with integrated knowledge translation (iKT). Integrated KT and UCD appear to have common themes and share a wealth of attributes important for successful KT: participation with others, reflection, and a goal of pursuing practical solutions for issues that concern people. This study only reports on and up to the creation of prototypes based on needs assessment and early participatory design sessions for review by target users. When the prototype is developed, future work will iteratively revise and adjust the prototypes as concepts and designs become more concrete, through participatory design and usability testing. The ability to integrate iKT activities through UCD provides an opportunity for enhanced knowledge translation.

The qualitative nature of this study meant that generalizability is not usually a key concern but rather transferability, where rigor of methods and the credibility of the findings are of concern [31]. We would envisage that our results would be generalizable to other similar contexts. However, we recognize that in the health service context, attempts to apply PD have been mainly restricted to the design of small-scale isolated systems for a limited set of users in a specific organizational unit [10], with a call for larger-scale PD approaches [14]. We acknowledge that the sample size is small and whilst it might reduce the generalizability we believe it will have resonance with those in health care planning contexts. Although the number of participants was less than anticipated, we observed rich and meaningful discussions which might be seen as a trade-off for the (limited) numbers [32]. Every effort was made to carefully facilitate focus groups, but it is possible that one or two people may have dominated the conversation, or that unknown organizational hierarchies limited the contribution of some individuals relative to others. Furthermore, during transcription of focus group audio recordings, some individuals were undistinguishable, making it difficult to attribute particular comments to specific individuals and thereby impossible to analyze the data on the level of individual perceptions and perspectives. The limited interactions experienced with study participants may also have missed any potential “super-users” – a category of system users that know more or are more technologically savvy than the average target user. Every effort was made to identify these potential individuals, and their perspectives included accordingly. A common issue when undertaking UCD is that participants may believe that the prototypes are the finished product. This can be mitigated by presenting the prototype as a low-fidelity paper-based drawing rather than in digital media such as MS Powerpoint®, and emphasizing the flexible and changeable nature of the existing design. Nonetheless, challenges remain with respect to actually designing an interface that can address all the design recommendations from users, due to constraints of the underlying tool itself and the ideal workflow integration. Ideally the user has maximum flexibility to interact with the tool and explore scenarios in a seamless process. However, this may be technically challenging as the user interface and the underlying tool have technical constraints that do not enable some of the features described by the users. Furthermore, there are also budget and time constraints to consider.

6. Conclusion

To our knowledge, we believe this is one of the first applications of a

Table 2
Attributes of Knowledge Translation and User Centered Design approaches.

Integrated Knowledge Translation	User-Centered Design
Identify problem	Needs assessment and participatory design, at different depths of focus: Understand what target users currently do to do their work, including existing software and hardware.
Adapt knowledge to local context	Needs assessment: Identify who the target users are, through interviews/focus groups with perceived target users, leading us to a better understanding of the actual target users.
Assess barriers to knowledge use	Needs assessment: Understand what challenges/barriers they face in trying to accomplish their goals with the existing tools
Select, tailor, implement interventions	Iterative development, participatory design, and usability testing: Create prototypes based on needs assessment and early participatory design sessions for review by target users. Iteratively revise and adjust prototypes as concepts and designs become more concrete, through participatory design and usability testing. Once the final product is complete, deploy in the target environment.
Monitor knowledge use	Not undertaken
Evaluate outcomes	Not undertaken
Sustain knowledge use	Not undertaken

user-centered design to be used in planning for health service delivery. This approach is well suited to identify health care planners' requirements for designing a user interface to improve health service planning and management of OA. Our approach demonstrated how user centered design, that shares many similarities with integrated knowledge translation can be used to enable knowledge translation.

Competing interests

DM is supported through a Canada Research Chair (Health Systems and Services Research), and the Arthur J.E. Chair in Rheumatology. The other authors have no competing interests.

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Author contributions

Concept and design of the study, (DM, EC), data collection (JB), and data analysis and interpretation (JB). All authors contributed to the development and revisions of the manuscript and have seen and approved the final version of the manuscript.

Summary table

What was already known on the topic	What this study added to our knowledge
Most examples of participatory design in healthcare are in specific clinical settings e.g. primary care, clinical trial protocols.	We provide an example of using participatory design in planning for osteoarthritis health service delivery
Uptake of decision support tools is often poor.	We identified specific design recommendations that will increase user acceptability and uptake of the user-interface and underlying decision support tool in practice.
The importance of user involvement as part of integrated knowledge translation (iKT) should be a cornerstone of research.	We identified that user-centered design shares similar goals and concepts with integrated knowledge translation (iKT). We demonstrated how UCD can enable knowledge translation.

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Appendix A. Focus group guide

1. What resources and tools do policy makers currently use to inform their planning activities?
2. What kinds of situations might you use an osteoarthritis policy planning tool in?
3. What roles in an organization might use a tool like this?
4. What kinds of features do you think would be useful in this kind of tool?

5. What kinds of features should NOT be included in this tool?

These script questions were adjusted for the supplementary interviews to elicit feedback on the current tools and methods and address data request processes the participants work with:

1. Tell me about the kinds of data requests you get
2. What about this process is particularly difficult/complex/frustrating?
3. What are some of the challenges that you currently face with the software you currently use?
4. Can you show us (or describe) some of the visualizations you use in your presentations and reports?
5. What kinds of features (or content) do you think would be useful in this kind of tool?
6. What kinds of features (or content) do you think should NOT be included in this tool?

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