Significance

Primary care and rural health practitioners are increasingly being challenged to provide quality care in an environment of significant barriers to access and rapidly changing delivery and payment models. They are being asked to serve in a central role in coordinating care for patients with complex health profiles and in supporting individuals with the self-management of chronic diseases. Point-of-care (POC) technologies have the potential to assist practitioners with these new challenges by improving diagnostic capacity, guiding the delivery of timely and appropriate treatments, and facilitating patient self-testing. But increased demands on the system and limited resources make it difficult for practices to adequately evaluate new technologies for purchase, especially given the complex evidence base and diverse criteria that are important for a comprehensive assessment of the clinical value of new devices and tests. Structured technology evaluation and decision-making processes tailored for rural health settings have the ability to inform adoption decisions and facilitate broader implementation of clinically useful POC technologies.

The AdoptPOC project described in this proposal draws from advances in three related fields: health technology assessment, decision analysis, and knowledge translation. In health technology assessment (HTA), professionals are adapting established methodologies to meet the specific needs of individual HTA users, evolving from a formerly reactive role to proactive involvement in decision processes [4]. The focus is shifting toward combining technology assessment with structured approaches to decision making to allow for explicit consideration of multiple decision criteria and stakeholder viewpoints, a critical aspect of a patient-centered health care system. These advances have predominantly impacted national-level policy makers in support of more transparent coverage, reimbursement and regulatory decisions. But HTA practitioners have recognized that organizations also have decision-making needs regarding utilization of new medical technologies, with significant differences in the types of evidence needed (e.g., colloquial and context-sensitive scientific data), as well as shortened decision timeframes and diverse stakeholders. Methodologies for hospital-based HTA have emerged to address organization-level needs [5], with a range of models available to accommodate different decision-making approaches in what are predominantly corporate environments. While these models serve as a basic framework for considering technology adoption in other settings, tailored approaches are needed to assist with evidence assessment in less formal rural settings, with a focus on multi-professional dialogue rather than utilization of complex value analysis models. To aid effective implementation of evidence utilization programs, the knowledge translation (KT) field is contributing to an understanding of the barriers and facilitators to the use of evidence in decision making, with context playing an important role at the individual, organizational, and environmental levels [6]. Various strategies are being developed to improve evidence use, including the implementation of accessible and efficient decision support tools and the creation of "knowledge broker" roles [7]. KT researchers have recently expanded beyond the focus on clinical practice to study evidence use in management decisions, with consideration of how decision makers with diverse backgrounds interpret or make sense of evidence. This proposal directly addresses the challenges identified by these recent KT studies on multi-professional "sensemaking" of evidence and its application to decision making in rural practices.

The Challenge of Evaluating Point-of-Care Devices

Evaluating medical tests and devices poses several challenges when compared to the assessment of interventions [8]. Test evaluation studies often focus solely on diagnostic accuracy and technical performance. Few studies directly address clinical outcomes, making it difficult to assess the applicability of available evidence for a particular setting of use and health care context. This is complicated by the fact that training and competence of the user, as well as organizational factors, can affect the outcomes associated with test utilization. Also, manufacturers frequently update medical devices, which can impact effectiveness and make assessments model-dependent. And, in general, practitioners are less familiar with assessing the quality and interpreting the results of test evaluation studies.

The assessment of point-of-care technologies is particularly complex, given the broad range of device types (e.g., in vitro diagnostics, imaging and non-invasive monitoring devices, mobile apps and telehealth systems), the numerous contexts of use [9], complex regulatory compliance and quality assurance considerations, and unclear financial impacts of implementation [10]. The main benefits typically associated with use of POC technologies are immediate access to actionable patient information, increased patient satisfaction, and access to specialized care in remote areas. But these benefits can be difficult for practices to realize given the strong influence of local and organizational factors. In the absence of structured approaches to considering evidence, decision makers often rely on vendor information and established relationships to select POC devices [11]. In other cases, individual practitioners promote the purchase of new technologies by "making the business case" for adoption. While this allows for presentation of selected evidence, the intent is to be persuasive, with the approach often lacking the input of stakeholders whose viewpoints are critical to achieve successful implementation. These limitations support the need for formal technology assessment approaches with structured decision making to evaluate the complex and heterogeneous evidence base for POC technologies and incorporate relevant stakeholder viewpoints.

Health Technology Assessment and Structured Decision Making in Organizations

The unique nature of organization-level HTA has led to the development of several hospital-based HTA approaches that are used to inform decisions regarding investment (or disinvestment) in new technologies. These approaches involve use of abbreviated HTA processes (the "mini-HTA"), *ad hoc* HTA committees or dedicated units within hospitals (e.g., value analysis committees), and individual opinion leaders ("ambassadors") who review and disseminate evidence. An international initiative (AdHopHTA) has been created to advance hospital-based HTA, with a handbook and toolkit scheduled for release in 2015 [5]. In a recent systematic review of the effects and impacts of hospital-based HTA [12], researchers found that formal HTA approaches have allowed hospital decision makers to achieve benefits in several areas (Table 1).

While formal HTA processes have been used in hospitals for many years to evaluate evidence, structured approaches to applying that evidence to decision making have only recently been adopted. Tools such as multiple criteria decision analysis (MCDA) are assisting with comparisons of alternative technologies and facilitating transparent and balanced

Table 1: Benefits of Hospital-Based HTA

- Cut costs and control expenditures
- Integrate patient needs and medical staff interests/capabilities with hospital resources
- Integrate technology decisions with organizational mission and strategic plan
- Deal with over-optimism of practitioners
- Provide comparisons with alternative technologies
- Make disinvestment decisions for over-utilized technologies
- Ease implementation of new technologies

consideration of competing priorities, as well as encouraging inclusion of stakeholder perspectives [13].

Several barriers exist to the successful implementation of formal HTA and structured decision-making approaches in organizations. These include a lack of understanding of the processes, the time burden associated with collecting and evaluating the evidence, the perception of loss of autonomy and ability to apply professional judgment, a lack of organizational support, and the differences among multi-professionals in interpreting and applying evidence to decision making. This latter issue was the topic of a recent UK study that evaluated the use of evidence by health care managers in making technology adoption decisions in hospitals [3]. The researchers found that access to and use of evidence types varied greatly among professional groups (characterized as clinicians, non-clinician managers, and hybrid clinician-managers), with a need to continuously interpret and reconstruct evidence according to professional identity, organizational role, team members and audience. This finding, coupled with the results of studies on effective methods to communicate information, is the foundation for the work proposed in this phase of the AdoptPOC project.

Communication and Dissemination of Evidence

An important component of evidence-informed decision making is the effective communication and dissemination of complex information. Studies have shown that format and content are important when considering ways to make data more meaningful, with effects on comprehension, the choice of alternatives, and preference for a specific display type [14]. Information designers are guided to use consistency with symbols, use visual cues to clarify the meaning of data, offer instructions and/or practice tasks for interpreting displays, summarize information, and order information by relevance. The most effective display format (e.g., table, graph, chart, visual, or text) tends to depend on the type of information presented and the characteristics of the user.

Most research in the area has been directed toward communication with patients and clinicians, with some recent consideration of the needs of policy makers. In many cases, this effort has been focused on development of evidence briefs to communicate the key findings of HTA reports or systematic reviews [15], or websites to improve dissemination of clinical research (e.g., Web CIPHER [16] and EVIPNet [17]). While these sites can possess some level of interactivity to aid user interpretation, their goal is wide dissemination of a specific type of evidence or information, and function essentially as online libraries or basic information resources.

The AdoptPOC project differs from existing resources in that it deals with the review of heterogeneous evidence and information by multi-professionals in a more defined, task-oriented context of sensemaking, structured around specific problems. Researchers in the field of information studies have identified core issues in designing information systems to assist sensemaking tasks in similar scenarios, and suggest presenting information in a way that allows structures, data, and information sources to be represented and manipulated in multiple formats [18]. The key consideration is organizing content in various conceptual structures to make it accessible to sensemakers with different prior knowledge and experiences. Additionally, they recommend providing integrated assistance to help sensemakers process new information, reduce complexity, examine concepts and relationships, and detect anomalies and inconsistencies in the data. The EU-funded DECIDE project [19] is currently producing interactive online tools with many of these features, with the aim of addressing "evidence-to-decision" challenges, although with a focus that is limited to dissemination of clinical guidelines.

The Benefits of eLearning

The design features recommended for effective communication of evidence can readily be accommodated through use of eLearning platforms, with the ability to tailor learning to individuals and to flexibly incorporate educational elements to aid comprehension of material. These strategies provide training to learners where and when it is needed and enable the tracking of learner activity. They additionally provide the opportunity to create collaborative learning environments and deliver consistent training across settings. A recent systematic review identified several key characteristics of eLearning approaches that are associated with improved learning outcomes, including use of interactivity, practice exercises, repetition, and feedback [20]. A major challenge with the AdoptPOC project is the simplification and streamlining of methods for evidence communication, evidence assessment and decision-making for use by busy rural health practitioners. eLearning approaches facilitate presentation of information in an understandable and interactive way and allow practitioners to learn in a self-directed and self-paced manner, which is important to encourage use of such systems for improved decision making.

Innovation

The tools and resources that are currently available to communicate and disseminate information for evidence-informed decision making are predominantly targeted to patients, clinicians, and policy makers. They focus mostly on providing clinical information and offer limited assistance with group processes and implementation. Additionally, they often separate evidence reports from educational materials that are important aids to interpretation and understanding of content and decision processes. Many are in formats that are inaccessible to busy practitioners and cover a narrower range of evidence types than is needed for organization-level technology adoption decisions. And most existing resources focus on evidence related to interventions, with limited consideration of medical devices and diagnostic technologies.

When completed, the AdoptPOC toolkit will provide a unified platform to communicate evidence on point-of-care technologies in a format that is accessible, relevant, and practical for rural health practitioners. The toolkit will provide eLearning-based training on skills and processes associated with evidence assessment and decision making. It will facilitate the sharing of evidence, colloquial data, and decision outcomes among practices with similar clinical and organizational needs, helping to address resource constraints, reduce duplication of effort, and improve the quality of technology adoption decisions. This phase of the project will produce evidence templates and interpretation guidance in the form of an eLearning module that address the different information needs and sensemaking approaches of multi-professionals, and encourage more complete and balanced consideration of available evidence.