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Comparative Effectiveness Research: A Roadmap for Physical Activity and Lifestyle

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Abstract

Purpose—Comparative Effectiveness Research (CER) is designed to support informed decision making at both the individual, population, and policy levels. The American College of Sports Medicine and partners convened a conference with the focus of building an agenda for CER within the context of physical activity and non-pharmacological lifestyle approaches in the prevention and treatment of chronic disease. This report summarizes the conference content and consensus recommendations that culminated in a CER Roadmap for Physical Activity and Lifestyle approaches to reducing the risk of chronic disease.

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CONFLICTS OF INTEREST

William G. Johnson, PhD: No Conflicts to Disclose

Abby C. King, PhD: Received funding from ACSM to participate in this initiative.

I-Min Lee, M.D., M.B.B.S., MPH, Sc.D.: No Conflicts to Disclose.

Methods—This conference focused on presentations and discussion around the following topic areas: 1) defining CER, 2) identifying the current funding climate to support CER, 3) summarizing methods for conducting CER, and 4) identifying CER opportunities for physical activity.

Results—This conference resulted in consensus recommendations to adopt a CER Roadmap for Physical Activity and Lifestyle approaches to reducing the risk of chronic disease. In general, this roadmap provides a systematic framework by which CER for physical activity can move from a planning phase, to a phase of engagement in CER related to lifestyle factors with particular emphasis on physical activity, to a societal change phase that results in changes in policy, practice, and health.

Conclusions—It is recommended that physical activity researchers and healthcare providers use the roadmap developed from this conference as a method to systematically engage in and apply CER to the promotion of physical activity as a key lifestyle behavior that can be effective at impacting a variety of health-related outcomes.

Keywords

exercise; CER; chronic disease; prevention; treatment

Introduction

Comparative Effectiveness Research (CER) is designed to support informed decision making at the individual, population, and policy levels. The objective is to provide evidence about which approaches and treatments work best, for whom, and when. With this information, consumers, clinicians, purchasers, and policy makers can make decisions based on the best available evidence, thus improving health care and potentially reducing costs.

There are numerous examples of the importance of physical activity and other lifestyle factors to improve health-related outcomes. Thus, in November 2012 the American College of Sports Medicine and partners convened a conference with the objective of building an agenda for CER about physical activity and non-pharmacological lifestyle approaches in the prevention and treatment of chronic disease. This report summarizes the conference content and consensus recommendations that culminated in a CER Roadmap for Physical Activity and Lifestyle approaches to reducing the risk of chronic disease and mitigating its effects on daily activities.

Defining CER

The Institute of Medicine defines CER as “the generation and synthesis of evidence that compares the benefits and harms of alternative methods to prevent, diagnose, treat, and monitor a clinical condition or to improve the delivery of care.”(10) According to the Institute of Medicine, “the purpose of CER is to assist consumers, clinicians, purchasers, and policy makers to make informed decisions that will improve health care at both the individual and population levels.”(10) While CER is part of the mission of Agency for Health Research and Quality, it is the sole mission of the Patient-Centered Outcomes Research Institute, which was created by the Affordable Care Act. The Patient-Centered Outcomes Research Institute uses the term Patient-Centered Outcomes Research to reflect a

focus on *individualized* decision making. Key elements of CER include representative study populations, head-to-head comparisons that matter to decision making, and outcomes that matter to patients.

While these definitions provide a conceptual understanding of CER, they may also constrain research in several ways. The data to facilitate decision making in community care are probabilities and preferences of patients who receive their care in the community; integrating collections of research-quality data into community practice can prove difficult. Consequently, the research is more likely to be compromised by missing data, protocol violations, and weak internal validity. Moreover, differences between established treatments are typically small. Therefore, head-to-head comparisons of active treatments will require reasonably large studies in order to detect small differences. However, key to this within the context of CER is the minimal intervention needed to produce change, which has been defined by Glasgow et al.(9) as “the minimal or lowest level of intervention intensity, expertise, and resources needed to achieve a clinically significant improvement in a specified outcome for a particular target population under a particular set of conditions, when delivered by a specified type of staff or interactive modality.” Thus, within the context of CER, it is imperative that intensity of treatment is balanced with effectiveness of the treatment modality, as this may impact the efficiency, reach, and cost of effective interventions across a broad spectrum of health outcomes.

The History of Funding for Comparative Effectiveness Research

The concepts of CER have been around since the 1950s, but it was not until 2003 that the U.S. Congress enlarged the mission of the Agency for Health Research and Quality by establishing a program focused on CER (see Figure 1). As part of the American Recovery and Reinvestment Act of 2009, the Congress appropriated \$1.1 billion for the National Institutes of Health, Agency for Health Research and Quality, and the Department of Health and Human Services Secretary’s Office for CER. It also mandated an Institute of Medicine study to set national priorities for the research questions to be addressed with the Agency for Health Research and Quality funding.(10) The Affordable Care Act took the next step toward establishing a national program of CER. Section 6301 of the ACA establishes the Patient-Centered Outcomes Research Institute and a Trust Fund (through per capita taxes on health insurers) sufficient to support an annual research budget of \$500 million. The Patient-Centered Outcomes Research Institute research program includes investigator-initiated research and research targeted on high priority conditions selected by stakeholder Advisory Panels. Unfortunately, the main source of CER funding, the Patient-Centered Outcomes Research Institute, sunsets in 2019 unless reauthorized by the US Congress (see Figure 1).

National Institutes of Health Funding for Physical Activity Comparative Effectiveness Research

It is important to gain insight into the scope of CER that is feasible with currently available resources, including ascertainment of the strengths and limitations of tools routinely employed in the conduct of research and the potential reach of research products when applied in practice. Analysis of a pool of recently federally funded research may also expose

the obstacles investigators face in embracing newer CER methods and addressing the health care practice needs of particular relevance to practitioners and patients.

Prior to the conference held in November 2012, the American College of Sports Medicine compiled a sample of funded physical activity CER applications in the National Institutes of Health portfolio from the perspective of researchers, health care providers, and patients. Applications were identified using the National Institutes of Health Research, Condition, and Disease Categorization code “comparative effectiveness research” to identify new physical activity research applications funded in fiscal years 2009 through 2011 (October 2008 through September 2011). In all applications, physical activity was examined as an intervention exposure or intervention outcome. The search yielded 31 physical activity CER studies: 15 awarded in fiscal year 2009, 10 awarded in fiscal year 2010, and 6 awarded in fiscal year 2011. The type of funding mechanism used to support these applications is summarized in Figure 2. Approximately 45% of the applications proposed to examine change in physical activity as the primary outcome, and the remaining 55% examined change in a health outcome as a result of a physical activity intervention. Body weight was the primary endpoint in 9 of the 17 applications that examined change in a health outcome as a consequence of the physical activity intervention.

To synthesize the information from the applications, a conceptual framework was adapted from the framework for phases of translational research (15). Briefly, applications were classed into one of five categories based on the primary intent of the research: (1) research that focused on the identification of a public health problem or opportunity; (2) new intervention development; (3) evaluation of whether a promising intervention could improve outcomes; (4) intervention translation, dissemination, and implementation research; or (5) intervention effectiveness or cost effectiveness. The majority of applications were either focused on new intervention development (n=10) or evaluation of the effect of a promising intervention on outcomes (n=17). Fewer applications targeted intervention translation, dissemination, and implementation research (n=4) or intervention effectiveness or cost effectiveness in population applications (n=3), and no applications were designed to specifically identify a public health problem or opportunity.

Another approach to examining the breadth of applications funded for physical activity CER was to examine applications designed to intervene on a disease continuum. Seven applications (23%) examined physical activity in the context of prevention, 19 applications (61%) were in the context of treatment or disease management, and five applications (16%) were in the context of survival or relapse prevention.

Finally, applications were grouped by study design to determine the methods applied to physical activity CER. Most applications employed a randomized controlled trial design (n=26), with two additional applications using an observational approach and one application focused on methods development. No applications employed modeling to assess effectiveness in populations.

In summary, examination of funded applications indicates the primary objective of physical activity CER to date has been to develop and test behavioral interventions to increase

physical activity and a secondary objective of the field has been to demonstrate an ability to influence body weight through physical activity modification. Opportunities exist to increase the scope and influence of physical activity CER, but maximizing capacity and impact may require directing resources and strategic targets differently. From a researcher perspective, trainings and tools for employing alternative analytic strategies and study designs are needed to answer complex public health and patient-relevant questions. From a provider perspective, packaged intervention tools of truly low time burden and financial and human cost are needed for service delivery and should be a primary outcome of research and development efforts. Finally, from a patient perspective, framing PA as a vital sign and something to be preserved and protected over the lifespan may be an encouraging public health message.

Comparative Effectiveness Research Methods

The standards for adopting new practices are constantly rising. The United States Preventive Task Force has taken the lead by using the balance of harms and benefits as the framework for deciding how strongly to recommend an intervention. The problem with this as a standard is that benefits and harms are usually measured in different units, which means that any attempt to decide whether benefits exceed harms (and by how much) is necessarily subjective rather than quantitative. Thus, quality-adjusted life years has been proposed as one measure of both harms and benefits.(24)

A measure of the balance of harms and benefits can have real meaning only when the evidence about the magnitude of the harms and benefits is strong. Therefore, a compelling body of evidence of comparative effectiveness is necessary to assess the balance of benefits and harms. Clinical policies (practice guidelines, performance measures, and insurance coverage) are based on systematic reviews that summarize a body of evidence comparing the benefits and harms of one intervention with that of another. Systematic reviews have this pivotal role because not only can they identify efficacious treatments and policies, they can also reveal a weak body of evidence. However, it is important to evaluate the credibility of the systematic review and meta-analysis methods, if applicable, and subsequently rating the confidence in the effect estimates presented in the review are critical to inform decision making.(21)

Decision analysis is becoming a central discipline in CER because it helps to identify the best decision for a particular patient. CER can generate the data necessary for decision models, which compare two interventions by calculating the expected outcomes with each. A decision maker should choose the intervention with the highest expected outcome because it will maximize the odds that a decision will turn out well, while not guaranteeing a favorable result. Thus, it is important to understand the methods that can be applied to CER, and Sox et al. provide a detailed discussion on medical decision making that is pertinent to CER.(26) Moreover, the medical decision making should take into account the patient's perspective of what outcomes are important.(1)

Observational Designs

Observational studies use “found” data from medical records, insurance claims, and disease registries. Observational studies, which use pre-existing data, are typically faster to perform,

involve larger numbers of patients, and are less expensive than studies in which data must be obtained during the study. In addition, efforts are underway to improve the translation of findings from types of studies into impactful influences on health-related outcomes.(16)

Despite the important contributions that can be achieved from observational studies, there are also problems that include missing data, relative sparse data sets, temporality issues, selection bias, and confounding. Of these problems, confounding is the most pernicious. The most prevalent form is confounding by indication, in which clinical factors that influence prognosis will also influence the physician's choice of treatment. Thus, the effectiveness of treatment and the patient's prognosis may influence clinical outcomes, and it is usually not possible to judge the relative effects of these two factors. Randomized assignment of treatment breaks this connection between treatment choice and outcome, so that in principle, the outcome is due only to treatment choice. There are four ways to reduce the effects of confounding in retrospective observational studies; however, these techniques only allow for mitigating confounding for measured variables. These factors are described in more detail in a recent review.(25)

1. *Regression modeling of outcomes*, which allows you to observe the effects of a treatment on outcomes while equalizing the effects of prognostic variables (such as age and comorbid conditions) between two groups.
2. *Instrumental variable analysis*, in which a factor, called an instrumental variable, (such as distance between home and medical center) is used to divide the population into groups to be compared. This is related to receipt of treatment and affects outcome only through its effect on treatment received.
3. *Propensity score analysis*, which is a technique to estimate the probability of receiving an intervention, using regression modeling. The propensity score can be used to compare patients with equal likelihoods of receiving a particular treatment. In this way, propensity score analysis is a means of diminishing confounding due to physicians' tendency to choose treatment in part based on their beliefs about the patient's prognosis.
4. *Sensitivity analysis*, in which a researcher postulates an unmeasured confounder and assigns it extreme high and low values. If the preferred option is the same with high and low values for the postulated confounder, the confounder is assumed to be unimportant.

Randomized Trials

As discussed already, a key to understanding confounding is to realize that factors that affect outcomes of treatment will often influence the choice of treatment. A more reliable way to avoid confounding is through randomized assignment to treatment, which, as discussed earlier, severs the connection between treatment choice and prognosis. However, an important distinction is that CER is focused on trials that compared effective treatments rather than on efficacy trials to initially identify an effective treatment.

Besides a simple trial in which treatment is assigned to randomly chosen study patients, there are three types of randomized trials generally used within CER:

1. *Cluster RCTS*, in which patient care units are randomized. It is the best choice when the intervention alters patient care workflow or when contamination is likely.
2. *Pragmatic trials*, which tend to be very large and enroll patients into treatments that are typical of routine clinical practice. These types of trials maximize external validity.
3. *Adaptive trial design*, is a relatively new approach and paradigm that can be used in CER.(14) It makes the most efficient use of patients who have agreed to be in the study, by discontinuing one comparison as soon as its comparator has been shown to be superior and comparing “the winner” with another intervention.(20) Thus, within *adaptive designs* or *SMART (Sequential Multiple Assignment Randomized Trial) designs*, rather than everyone receiving the same treatment throughout the study, the treatment received may change and is adapted based on response to treatment. An example of algorithm for an adapted design has been published by Jakicic et al.(12)

Perhaps most important for patient decision making is to identify subgroups that respond more favorably to different treatments (treatment response heterogeneity.) CER is patient-centered and its theme is evidence-based *individualized* care. Therefore, trying to detect treatment heterogeneity is important. Studies must enroll enough patients to assure that pre-specified subgroups are large enough to make valid comparisons of the rates of outcomes in the treatments. Methods for individualizing treatment choice may include measuring patient preferences for the outcomes they may experience, treatment response heterogeneity, and clinical prediction rules for estimating probability.

In summary, CER compares active interventions in typical community practice and uses the results help patients and other stakeholders to make individualized decisions about how to intervene. Randomized trials give reliable answers but are slow, expensive, and difficult in community practice settings. Observational studies give less reliable answers (because of confounding) but they are fast, less expensive, and if conducted well, representative of daily practice. CER needs to balance the strength and limitations of both the randomized trial and observational studies designs when determining the appropriate approach for examining the effect of physical activity and other lifestyle parameters on a variety of health-related outcomes.

Comparative Effectiveness Research Opportunities for Physical Activity

At the core of CER, as it pertains to physical activity, is how this important lifestyle factor compares to other more traditional forms of medical management for the prevention and treatment of chronic disease. These types of clinical interventions are likely to be the area of greatest interest to funding agencies that may include the Patient-Centered Outcomes Research Institute, especially if physical activity is shown to be a cost-effective alternative to more traditional forms of chronic disease management. These comparisons can take on numerous forms. One example would be observational comparisons of physical activity to other forms of medical management that can be obtained from medical records. However,

until recently, physical activity has rarely been assessed and documented as a component of the traditional physical examination by a health-care provider. Thus, encouraging assessment of physical activity as a key health indicator during regular medical visit will provide the necessary information to conduct this form of CER. In fact, it has been suggested that physical activity be considered as a fifth vital sign as a component of routine medical care. (22) Moreover, it has been shown that physical activity data included in an outpatient electronic medical record can provide a valid measure of physical activity,(3) and this may provide a valuable resource when conducting CER to evaluate the effectiveness of physical activity as a key lifestyle behavior to improve health.

Alternatively, opportunities exist to randomize patients to receive physical activity either independently or in combination with other medical treatment approaches to examine the effectiveness of physical activity to improve health outcomes. These medical interventions that can be used as a comparison include pharmacotherapy, surgical procedures, and others. An example of this type of research is the Diabetes Prevention Program that compared an intensive lifestyle intervention for weight loss, nutrition, and physical activity to pharmacotherapy and standard care for the prevention of type 2 diabetes (5). This study reported that the lifestyle intervention was more effective than either of the comparison groups for the prevention of type 2 diabetes. In a randomized, placebo-controlled study on the effect of exercise on mild-to-moderate major depressive disorders, exercise was shown to work at least as well as drug therapy or behavioral therapy and had much better remission rates (6). This type of research can serve as examples of designs that can be used to study the comparative effectiveness of physical activity and healthy lifestyle factors for improving health-related outcomes across a variety of populations.

An additional opportunity is for physical activity to be an adjunct to medical treatment to improve the effectiveness of these treatments. For example, bariatric surgery has been shown to be an effective intervention for the treatment of obesity.(4, 23) However, the addition of sufficient levels of physical activity within the context of bariatric surgery improves weight loss when compare to bariatric surgery alone or when combined with lower doses of physical activity.(2, 7, 13) This provides an example of how physical activity can be consider as an adjunct to standard medical treatment, and CER can propose study designs to specifically examine the role of physical activity in this capacity across an array of health-related conditions.

Within CER, physical activity will be compared to existing and well-established medical prevention and treatment approaches. Thus, in order for physical activity to be deemed an acceptable public health approach, a number of initial steps may first need to be taken. First, CER may need to examine if different intervention strategies are more effective at improving engagement in physical activity as a behavior. Many studies have shown that interventions involving direct supervision within physical activity centers have been effective at increasing physical activity across a wide range of populations. While beneficial from a research perspective to quantify physical activity, encouraging physical activity to be conducted only in facilities that allow for direct supervision by an exercise professional is less appealing from a broad public health perspective. However, many studies have shown that interventions involving non-supervised physical activity can also be effective for improving

physical activity engagement. While a few studies have been conducted that have directly compared supervised versus non-supervised physical activity, additional research is needed to understand the similarities and differences between these two approaches. Thus, a target of CER should be to compare the effectiveness of supervised versus non-supervised physical activity on physical activity engagement and on health-related outcomes.

Another target that may facilitate CER for physical activity is to examine if the effectiveness of physical activity on health outcomes vary by type, dose, or intensity of physical activity. While there are existing public health recommendations, refining these recommendations based on disease state may be beneficial to facilitate CER, especially as different types, doses, or intensities of physical activity affect health outcomes compared to other medical approaches (e.g., pharmacotherapy, surgery, other medical procedures, etc.). For example, the Nurses' Health Study reported that the risk of hip fracture declined in a dose-dependent manner with increasing exercise (8), such that women who spend one hour a day at a brisk walk-jog reduce their risk of hip fractures by 55%. However, what is unclear is whether a specific dose of physical activity reduces hip fracture in a comparable or a more effective manner when compared to other nutritional approaches or pharmacotherapy, or whether the effect of these interventions can be enhanced with the addition of a specific dose or type of physical activity. Conducting this type of research may provide important justification to support broader CER studies with regard to the importance of physical activity as an effective lifestyle behavior to improve a broad array of health-related outcomes.

There is a wealth of research to show that physical activity can have many positive effects on a variety of health-related outcomes. However, of particular interest, a systematic search of three databases that was conducted prior to the conference in November 2012 did not identify studies related to physical activity that would typically be considered CER. Despite this, there are examples in the literature to suggest that physical activity would compare well to other existing therapies. For example, meta-analyses exist that show exercise-based cardiac rehabilitation is beneficial when compared to usual care in patients with coronary heart disease (17). Comprehensive intensive lifestyle interventions that include a combination of physical activity and dietary change that results in weight loss can be more effective than pharmacotherapy for the prevention of type 2 diabetes (5). Moreover, recent findings from the Look AHEAD Trial has shown that weight loss resulting from physical activity and dietary change can improve a variety of cardiovascular disease risk factors with less reliance on medication (18, 19), and improved fitness has an independent effect on improved diabetes control as measured by HbA1c, even after controlling for the use of diabetes medication (11).

A Roadmap for CER: Physical Activity and Lifestyle

The process of applying CER to physical activity and lifestyle is in its early phases of implementation. Thus, the 2012 CER conference was intended to begin the process of achieving a number of objectives related to CER within the context of physical activity and other lifestyle parameters. These objectives included: 1) building an agenda for CER involving physical activity and lifestyle approaches compared to pharmacologic and procedure interventions for chronic disease risk reduction and treatment, 2) elevating the

recognition of lifestyle approaches for the prevention and treatment of chronic diseases and conditions, 3) creating a collaborative research network to develop a body of evidence about the efficacy and effectiveness of physical activity and lifestyle approaches for prevention and treatment of chronic disease and other various risk factors and conditions, and 4) increasing communication about the importance of physical activity and lifestyle approaches for the prevention and treatment of chronic diseases and conditions. To begin the process of achieving these objectives, the context of this conference focused on defining CER, identifying the current funding climate to support CER, summarizing methods for conducting CER, and identifying CER opportunities for physical activity.

Based on discussions and deliberations that occurred within the context of the CER conference, the attendees determined that a systematic approach was needed to advance CER for physical activity. Thus, the attendees collaborated to develop a roadmap for CER related to physical activity. This roadmap is shown in Figure 3. In general, this roadmap provides a systematic framework by which CER for physical activity can move from a planning phase, to a phase of engagement in CER related to lifestyle factors with particular emphasis on physical activity, to a societal change phase that results in changes in policy, practice, and health. It is recommended that physical activity researchers and healthcare providers use this roadmap as a method to systematically engage in and apply CER to the promotion of physical activity as a key lifestyle behavior that can be effective at impacting a variety of health-related outcomes.

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Sporadic studies that fit the definition of CER [e.g., Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT)]	U.S. Congress allocates a \$24 million increase in funding for the AHRQ to conducting CER involving systematic reviews and research using data sets.	The American Recovery and Reinvestment Act allocates \$1.1B divided between AHRQ, NIH, and the Secretary of DHHS. The IOM reports on national priorities for CER	The Affordable Care Act establishes PCORI.	PCORI sunsets in 2019 unless reauthorized by the US Congress
↑ 1950s	↑ 2003	↑ 2009	↑ 2010	↑ 2019

CER = Comparative Effectiveness Research
 AHRQ = Agency for Healthcare Research and Quality
 NIH = National Institutes of Health
 DHHS = Department of Health and Human Services
 IOM = Institute of Medicine
 PCORI = Patient-Centered Outcomes Research Institute

Figure 1.
 The history and timeline for comparative effectiveness research.

Figure 2.
Distribution of physical activity focused grants by type of National Institutes of Health Funding Mechanism in Fiscal Years 2009–2011.

	Pre-CER Phase (Preparation)	→ CER Phase (Full Engagement)	→ Societal Change Phase (Policy/Practice/Health)
Research and Evaluation	<ul style="list-style-type: none"> Conduct systematic reviews Identify barriers Organize/apply existing research 	<ul style="list-style-type: none"> Improve behavioral and environmental interventions Enhance comparisons of behavioral and environmental physical activity interventions with other interventions and disease outcomes (diabetes, back pain, pain, aging) Increase research on clinical, healthcare policy, public health issues Highlight cost-effectiveness in as many studies as possible (reduction in health care utilization) Improve dissemination showing different methods to implement proven physical activity interventions Measure multiple outcomes (where physical activity will show strong effect) 	<ul style="list-style-type: none"> Continually evaluate the implementation and effect of policy and practice changes Establish surveillance of physical activity-related practice and policies Conduct updated systematic reviews
Methods	<ul style="list-style-type: none"> Develop consensus on best research methodologies for physical activity CER 	<ul style="list-style-type: none"> Expand use of best methodologies and development of guidelines and new CER physical activity methods 	<ul style="list-style-type: none"> Build on wide acceptance of CER methodologies Continually enhance guidelines and methods
Translation and Dissemination	<ul style="list-style-type: none"> Build website for CER physical activity information Create CER physical activity networks 	<ul style="list-style-type: none"> Continually enhance the website Grow and expand engagement of CER physical activity networks 	<ul style="list-style-type: none"> Develop use of quality control mechanisms Provide training to implement proven interventions
Workforce and Collaborations	<ul style="list-style-type: none"> Create collaborations: intra-organization and inter-sector Establish a Task Force to coordinated effort Work with other countries who have successful models Increase understanding of CER and how to interpret it 	<ul style="list-style-type: none"> Expand collaborations, international work, and training in CER and physical activity 	<ul style="list-style-type: none"> Update professional training to include delivery of evidence-based behavioral interventions Continue to increase impact and influence of workforce and collaborations
Advocacy	<ul style="list-style-type: none"> Promote awareness of PCORI Get PA experts of PCORE committees, boards, and IOM Develop Congressional support and other advocacy 	<ul style="list-style-type: none"> Continue to expand involvement Ensure physical activity experts are on PCORI and other review panels and study sections 	<ul style="list-style-type: none"> Expand successful influence on research and policy for physical activity in CER Billing code for physical activity Reimbursement for physical activity professionals to work with patients Physical activity as a vital sign in electronic medical record Preventive Task Force influenced Physical activity tools for health care providers and the built environment Evidence-based methods for translating research results into policy
Funding	<ul style="list-style-type: none"> Identify and secure new and diverse funding opportunities and partners 	<ul style="list-style-type: none"> Continuously increase funding and capacity for CER and physical activity 	<ul style="list-style-type: none"> CER and physical activity have exponentially more funding and capacity, and are highly attractive and influential
Health Disparities	<ul style="list-style-type: none"> Identify important research needs that CER can address to reduce health disparities 	<ul style="list-style-type: none"> Expand physical activity and CER funding and grants 	<ul style="list-style-type: none"> Health disparities reduced through robust physical activity and CER research, practice, and policy

Figure 3.

Proposed roadmap for advancing comparative effectiveness research (CER) related to physical activity and other lifestyle behaviors.