

# Playing in the Sandbox: Considerations When Leading or Participating on a Multidisciplinary Research Team

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## INTRODUCTION

Research involves working to find answers to questions. Research questions of interest to pharmacists generally relate to any aspect of the discovery, effect, or use of medications, as well as the role of pharmacists within the health care system. This article describes the key aspects of leading or participating on a multidisciplinary research team so as to provide guidance to pharmacists involved in the research enterprise.

The research questions that emerge from topics well suited to the expertise and experience of a pharmacist are often, by their inherent nature, best addressed by a team of people from different scientific backgrounds: individuals who can form a multidisciplinary team that will work together to develop and carry out all aspects of the research project. Although not all research questions require multidisciplinary research teams, it is beneficial to work as a team, with different perspectives, knowledge, and skills available to answer complex, multifaceted research questions. The team can integrate ideas across disciplines, advance thinking within and across disciplines, and go deeper and broader to create knowledge that can be used to develop novel, more meaningful solutions. Individual team members can also get to know new people (their fellow team members), achieve greater personal satisfaction, and have more fun along the way. Working as a team helps to improve knowledge translation of findings in multiple sectors, thereby increasing uptake and sustainability, and also creates wider networks and encourages development of professional relationships.

Research funding agencies worldwide, including the Canadian Institutes of Health Research (CIHR), the National Institutes of Health in the United States, and the World Health Organization, have encouraged multidisciplinary research as a mechanism to stimulate new ways of researchers working together to find innovative solutions to complex health challenges.<sup>1,2</sup> CIHR has explicitly stated that to achieve its mission, it will promote a solutions-focused, multidisciplinary, and collaborative approach

to health research.<sup>3</sup> Research agencies' and funders' encouragement of multidisciplinary team-based research is a substantial shift away from the tradition of sole investigator-led research enterprises.

Pharmacists are extremely well suited to lead or participate on research teams because their drug therapy expertise can contribute an essential aspect to multidisciplinary solutions that may resolve many of today's health challenges. New approaches in molecular pharmacology, nanotechnology, biomarkers, biotherapeutics, pharmacogenetics, and other areas are rapidly changing the ways in which drugs are discovered and used. As drugs become more expensive and more personalized, drug policy decision-makers face new and more difficult challenges. The processes of medication prescribing and use are also complex: though centred on the patient, these processes are influenced by many health disciplines and multiple organizations within the health care system. For example, the processes of medication reconciliation may involve the patient, hospital, community or long-term care pharmacists, family or specialist physicians, and hospital and community organizations. Research may be additionally informed by experts in information technology, workflow engineering, behaviour change, or health care system change. Therefore, effective solutions to challenging medication-related issues are more likely to be generated when examined through a broad, multifaceted lens. Scientists with pharmacy or pharmaceutical science training can bring an important and unique perspective to drug discovery research, as well as facilitating or conducting research on how drugs are used in real-world practice and policy.

Pharmacists are also excellent leaders or members of research teams because they are highly experienced in establishing and maintaining good collaborative working relationships as members of multidisciplinary health care teams. The characteristics of effective multidisciplinary health care teamwork are varied and extensive (Box 1).<sup>4</sup> These characteristics apply equally well to the conduct of multidisciplinary research.<sup>2</sup>

## WHO IS ON THE RESEARCH TEAM?

CIHR defines a researcher as anyone who carries out research activities. It further expands on this definition by specifying that independent researchers are autonomous regarding their research activities, hold an up-to-date academic or research appointment, carry out investigation in areas for which they are independent researchers and not areas of research where they are trainees, and have sufficient time to devote to the proposed research.<sup>5</sup>

A research team will often consist of a principal investigator (PI) or program leader, co-investigators, collaborators, research staff, administrative support, and trainees. It is also becoming common for teams to encourage the active participation of knowledge users as research team members. Some examples of research team members are provided in Table 1,<sup>6,9</sup> including examples of knowledge users. A pharmacist who is a full-time university professorial appointee or a part-time appointee (as clinician–educator or clinician–scientist) or an institutional (e.g., hospital, long-term care) employee can usually also assume the role of PI on a research study. Local institutional requirements vary, so it may be helpful to verify these requirements before progressing far along in the development of a research project. Most pharmacists working in hospital, community, primary care, or long-term care practice can participate on a research team in some manner, including as a co-investigator or collaborator.

### Role of the Principal Investigator

The PI or program leader is considered the leader of the research team and accordingly has a number of specific responsibilities. The PI (termed the “principal applicant” by CIHR) is responsible for the scientific direction, content, and discoveries of the research, administrative and financial activities, ethics requirements, project management, and the activities of trainees (and their associated supervisors) related to the project.<sup>5</sup> The PI role may be shared by more than one person if the research study or program proposed is believed to benefit from a coleadership model. In some universities and hospitals, a trainee (i.e., an undergraduate or graduate student, resident, or fellow) may be able to serve as a PI if the trainee is carrying out the research under the guidance of a supervisor who is recognized by the institution where the project will be carried out and the funding agency (if external funding is involved).

### Roles of Other Team Members

People with different roles and skill sets form the remainder of a research team. A team is a group of people with a full set of complementary skills required to complete a task, job, or project. One of the main roles of the PI is to determine who should be on the research team. This task will often be carried out in collaboration with initial team members as the team begins to form. Team members are expected to operate with a high degree of interdependence, share authority and responsibility for self-management, be accountable for the collective performance of

### Box 1. Characteristics of Effective Multidisciplinary Teamwork in Health Care

- Good communication
- Respect and understanding of role
- Appropriate skill mix
- Good understanding within the team of quality and outcomes that the team is striving to attain
- Appropriate team processes and access to needed physical resources
- A clear vision
- Ability to work flexibly
- Excellent leadership
- Positive team culture (e.g., trust, mutual respect, reliability, commitment, and support)
- Training and development opportunities
- Seen by external stakeholders as contributing a service
- Team members with desirable personal attributes
- Recognition of the benefits each individual will gain from participation on the team

the team, and work toward a common goal and shared reward(s). When a strong sense of mutual commitment creates synergy, the team becomes more than just a collection of people, and the level of performance generated is greater than the sum of the performance of its individual members.<sup>10</sup>

Research teams investigating questions related to medications or delivery of health services will often benefit from the contribution of key co-investigator team members. A co-investigator is an individual who works with the PI to contribute to the scientific development or implementation of a project.<sup>5,11</sup> A co-investigator may be someone at the PI’s home institution or someone external to the institution. A co-investigator typically has specific knowledge or skills that will add unique value to the project, such as knowledge of a specific area of therapeutics, research design skills, or specific statistical skills. A co-investigator would be expected to devote a mutually agreed amount of time to the project and would be involved in all phases of the project from research design through to publication of the findings.

Teams may also include collaborators, research and administrative staff, and trainees. The role of a collaborator, whether an individual or an organization, is to provide a specific service in relation to the proposed activities (e.g., access to needed equipment or access to a particular patient population).<sup>5</sup> Collaborators are not usually involved in all phases of the project, but it is often beneficial to include them in the planning process, so that the PI and other team members will better understand what is feasible. Research staff, including research coordinators or research assistants, can help to carry out various aspects of the research plan: patient consent and recruitment, data collection, data management, and data analysis. Administrative staff can provide valuable assistance with many tasks, including meeting coordination, document organization, financial record-keeping and

**Table 1. Examples of Team Research Projects Published in the Literature**

Project	Expertise or Roles within Team	Primary Knowledge Users	Reference
Goal attainment scaling in cardiovascular patients	Pharmacy resident (principal investigator), pharmacist clinician–educators (sharing the role of formal supervisors)	Hospital pharmacy department	Nieuwstraten et al. <sup>6</sup>
Descriptive analysis of the innovative Ontario Pharmacy Smoking Cessation Program	PharmD student trainee, pharmacoepidemiologist (principal investigator), administrative dataset programming analyst, pharmacists, PhD trainees	Ontario Pharmacists Association, Ontario Ministry of Health and Long-Term Care	Wong et al. <sup>7</sup>
Descriptive analysis of medication recommendations to physicians by pharmacists	Pharmacists (one as principal investigator), health services researcher, research study implementer (research coordinator), sociologist, health economist, statistician, pharmacy student, family physician	Ontario Ministry of Health and Long-Term Care, various pharmacy organizations	Dolovich et al. <sup>8</sup>
Cardiovascular Health Awareness Program	Sociologist (co–principal investigator), epidemiologist (co–principal investigator), pharmacists (one as a co–principal investigator), health services researcher, administrative data experts, research study implementer (research coordinators), nurse, statistician, family physicians, health economist, health informatics specialist	Ontario Ministry of Health and Long-Term Care, Ontario Ministry of Health Promotion, Hypertension Canada, Canadian Stroke Network*	Kaczorowski et al. <sup>9</sup>

\*Some entities are no longer in existence or have been transformed into new entities since publication of the study.

transactions, and writing of publications and reports. Whenever possible, it is advantageous to include trainees as part of the research team, with the ultimate aim of building research capacity. Trainees may include undergraduate students, residents, clinical fellows, graduate students (master’s or doctoral level), or postdoctoral fellows. The Drug Safety and Effectiveness Cross-Disciplinary Training (DSECT) Program is one example of a national training initiative with a growing set of resources and opportunities designed to build research capacity in the area of drug safety and effectiveness research.<sup>12</sup>

Another key group on a research team consists of knowledge users. A knowledge user is an individual who is likely to use knowledge generated from the research to make informed, evidence-based decisions about health research, policies, programs, and/or practices.<sup>13</sup> Knowledge users can be, but are not limited to, practitioners, policy-makers, educators, decision-makers, health care administrators, community leaders, or individuals in a health charity, patient group, private sector organization, or media outlet. The inclusion of knowledge users as part of the research team, working in a manner that supports integrated knowledge translation, promotes the coproduction of knowledge and helps to ensure that the new knowledge being generated by the research is applicable to the real world and that the results can more effectively be translated into practice.

### Identifying Members of a Research Team

Each research study is distinct, as it is driven by a primary research question asked within a unique context. This distinctiveness can make it daunting to assemble the research team. The main considerations for selecting team members include ensuring appropriate scientific expertise, considering the mix of junior and senior people (including trainees), ensuring optimal support from research and administrative staff, and integrating with the best representation of knowledge users.

The research question will drive the research plan, which in turn will dictate the types of expertise needed to carry out the project. For research related to medications or pharmacy practice, areas of expertise that should be considered are knowledge in specific areas related to drugs or disease, such as pathophysiology, pharmacology, or therapeutics; health care services and systems knowledge, such as pharmacy or health professional practice or health care systems; and knowledge in specific areas of research methodology, such as research design (e.g., clinical trials, systematic overviews, observational studies), development of data collection tools, statistics, or health economics.

It is also helpful to have a combination of junior and senior team members, including formal trainees. Senior members can mentor the junior members and allow them to experience genuine responsibilities and learning opportunities so as to grow their skills and receive credit for participation. Mentorship is associated with

improved scientific output and career satisfaction for both mentors and mentees.<sup>14</sup> Mentors can provide advice on the specific development or execution of a research project or program and can also provide guidance on general aspects of professional life such as networking, career development, time management, and other professional skills. Box 2 lists the questions an individual can think about when considering leading or participating on a research team.

### Working Effectively as a Team

It is critical that teams understand themselves in terms of stage, composition, structure, and collaborative practices to encourage high-performance collaboration. According to the Model of Group Development, research teams and other groups form and develop in specific stages to reach their highest potential.<sup>15,16</sup> The model consists of 5 stages: forming (establish), storming (determine roles and responsibilities), norming (begin to work well together), performing (work seamlessly), and adjourning or transforming (natural end, new project).<sup>15,16</sup> It can be helpful for team members to recognize these stages as the team evolves, by having regular discussions about progress through the stages in relation to collaborative practice and team output.

Diversity has been found to increase both team productivity and the quality of end products.<sup>17</sup> Team member diversity can be considered across a wide range of factors, including ethnicity, gender, culture, career stage, past collaborations with other team members, mode of approach to a problem (e.g., specialist, generalist), types of disciplines, numbers of individuals in each discipline, and points of view. Along with diversity, strong interpersonal skills—including empathy, honesty, clarity, integrity, accountability, and emotional engagement with the research—will affect interactions within the team, such as team functioning and team communication, all of which will consequently affect the team's ability to produce meaningful outcomes.<sup>17</sup>

Effective multidisciplinary collaboration to produce high-performing collaborative research teams also necessitates careful consideration of processes and goals, as well as understanding and management of basic philosophical differences among team members.<sup>17,18</sup> The emerging field of the “science of team science” includes conceptual and methodological approaches to better understanding and enhancing the processes and outcomes of collaborative, team-based research.<sup>19</sup>

Appendix 1 (available at [www.cjhp-online.ca/index.php/cjhp/issue/view/111/showToc](http://www.cjhp-online.ca/index.php/cjhp/issue/view/111/showToc)) contains a checklist of activities to help foster collaboration within a multidisciplinary research team, based on *Collaboration & Team Science: A Field Guide*, a publication of the National Institutes of Health.<sup>20</sup> The checklist covers the areas of preparing to be on a research team, building a research team, fostering trust, developing a shared vision, communicating about science, sharing recognition and credit, handling conflict, strengthening the team, and navigating and leveraging networks and systems.

### Box 2. Questions to Think About When Considering Whether to Lead or Participate on a Research Team

- Do I think the research will answer an important question?
- Are there other or additional questions that the research could address?
- What knowledge or skills do I have to contribute?
- What past experience can I contribute?
- How much time do I have?
- How can the work make a difference to my patients? My practice? My organization? The health care system?
- Who else would be a good addition to the team as a researcher? As a knowledge user?
- What challenges do I foresee in conducting the research? In finding the answer to the research question?
- Who is interested in the answer to the research question?
- What are my specific roles and responsibilities on the team?
- What resources will I have available to help me be successful in carrying out my responsibilities on the team?

### WHAT ARE THE BENEFITS AND CHALLENGES OF MULTIDISCIPLINARY TEAM RESEARCH?

There are many benefits to leading or participating on a multidisciplinary team. Some of the benefits of team membership include availability of new opportunities to team members (e.g., scientific, grants), improved networking through new contacts across multiple disciplines, new learning through the contribution of additional viewpoints to scientific and operational discussions, and ability to access multiple mentors during one's career.<sup>21</sup> Individual team members can also realize benefits through seeing the rewards—for patients, a practice setting, an organization, or a health care system—that are generated by the research. For example, the findings from research conducted on topics such as medication reconciliation, drug-use evaluation, specific pharmacy department policies, or the application of clinical practice guidelines can help change clinical care processes.

There are also recognized challenges to leading or participating on a multidisciplinary team, such as the greater uncertainty experienced by each team member, in terms of the technical and evaluative knowledge required to carry out the project, relative to those working independently within their known areas of scientific inquiry; the limitations of a path of inquiry that extends outside one's discipline or crosses disciplinary boundaries; the need to engage in more communication or to listen to multiple viewpoints because more people are involved in the work; dependence on others for various elements of the work; a generally longer start-up time, given the larger organizational complexity of teamwork; and the potential of feeling “lost in the crowd” (because of the need to share recognition, credit, and power).<sup>21</sup> There are also numerous career challenges to multidisciplinary collaboration that need to be considered, such as whether the effort and time to achieve a product and resultant recognition



of contribution and credit are acceptable, given the need to simultaneously meet institutional requirements for project time-lines or promotion and tenure.<sup>21</sup> It also becomes more difficult for people to keep up with the multiple demands of professional life, including research, as teamwork becomes more common, along with the multiple mechanisms for constant communication that have become more pervasive in people's everyday lives.

Despite these challenges, the important areas of contribution by pharmacists, whether in drug discovery or effect, use of medications, or role of the pharmacist within the health care system, are well served through leading or participating in multi-disciplinary collaborative research teams.

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