

Building and Maintaining an Interdisciplinary Research Team

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Summary: Successful grant-writing in Alzheimer disease research, as with many other diseases, requires collaborative work among a group of individuals who represent various disciplines of relevance to the research problem. Interdisciplinary teams in Alzheimer disease research have the potential to explore more facets of a given research problem than teams that are not interdisciplinary in nature. Such teams also have the potential to produce better science and to disseminate results to a wider spectrum of relevant groups, may be more successful in achieving funding, and are stimulating and growth-enhancing for members. Building and maintaining these teams is a complex and challenging process, but identification and proactive resolution of challenges is essential. Important elements of success include establishing common goals, using a democratic group process, maintaining open communication, developing mutually acceptable policies for disseminating research results, and facilitating achievement of team members' personal and professional goals. **Key Words:** Alzheimer disease research—Interdisciplinary—Collaboration.

Successful grant-writing in Alzheimer disease research, as with many other diseases, requires collaborative work among a group of individuals who represent various disciplines of relevance to the research problem. Collaborative research has been defined as "... a cooperative endeavor among professionals who consider each other as peers and who also share values of democratic governance" (Williams, 1987). In addition, "interdisciplinary" has been distinguished from "multidisciplinary" to mean that several disciplines work together on the same research problem in a collaborative effort to which each individual contributes (Oberst, 1980). Collaboration and interdisciplinary work are the foundation of this paper, which describes how to build and maintain an interdisciplinary team to conduct Alzheimer disease research and includes a discussion of advantages, disadvantages, and components of success.

There are many reasons for taking an interdisciplinary approach to Alzheimer disease research (see Table 1). First, the disease is a multidimensional phenomenon with three major areas of concern: etiology and risk fac-

tors, assessment and diagnosis, and management (National Institute on Aging, 1997). Second, multiple research needs and opportunities exist, accompanied by a wide array of potential funding sources. Third, advancement of science necessitates collaborative interdisciplinary research. Careful examination of Table 1 suggests that the multiple dimensions of Alzheimer disease, potential funding sources, and areas in which science may be advanced, provide numerous interdisciplinary collaborative opportunities for both basic and clinical disciplines. For example, studies that examine etiology and risk factors might include cell biology, genetics, molecular pathology, and epidemiology. Studies focusing on assessment and diagnosis might include geriatric clinical medicine, genetics, and radiology. Studies that explore management approaches could include individuals from clinical medicine, nursing, psychology, psychiatry, and speech and language pathology.

Additional reasons for conducting interdisciplinary research are related to academic resources, priorities, and funding agencies. Resources can be maximized with interdisciplinary research, which appears to be increasingly valued and emphasized by academic institutions. Collaborative interdisciplinary research also provides opportunities for researchers to socialize younger investigators, particularly doctoral students, as well as expand

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TABLE 1. *Alzheimer disease as an opportunity for interdisciplinary research*

Multiple dimensions
Etiology and risk factors
Basic biology of an aging nervous system, death of nerve cells, loss of communication between nerve cells
Assessment and diagnosis
Assessment of risk factors, diagnostic markers, improved tests and case-finding
Management
Treatment, improvement in function, support of caregivers
Potential funding sources
National Institutes of Health (NIH): Aging, Diabetes and Digestive and Kidney Diseases; Heart, Lung, and Blood; Mental Health; Neurological Disorders and Stroke; Nursing Research
Centers and Institutes at NIH: Center for Research Resources; Human Genome Research Institute
Other agencies and foundations: public and private
Areas for advancing science
Basic science
Communicating information, using energy, repairing cells, genetics
Applied science
Cognitive abilities, assessment and diagnosis, management, outcomes
Translational research
Transgenic mouse model

Content drawn from National Institute of Aging (1997; see references).

their own research networks. In the competitive arena of research grants, an interdisciplinary approach may help eliminate common reasons why investigators are not funded. Examples include lack of demonstrated expertise on the research team, methodologies that are not state-of-the-art, literature reviews that lack balance with respect to different disciplinary perspectives, and use of inappropriate designs or statistical procedures.

The concept of the "research team" is important in interdisciplinary research. A team can be defined as a group of people representing multiple disciplines, each with unique contributions to make to the research problem. The team has a designated leader, often termed the "principal investigator." Members of the team can be co-investigators, consultants who provide specific expertise, and staff who are hired to perform certain functions essential to the conduct of the research. Research teams can expand and contract over time, and roles of individual team members can change. Although the team is not a rigid or static entity, successful teams do usually have a stable core of investigators.

ADVANTAGES AND DISADVANTAGES OF INTERDISCIPLINARY RESEARCH TEAMS

Interdisciplinary research teams provide the investigator with a number of important advantages. Members of different disciplines bring unique and complementary

knowledge, expertise, and skills to the research problem. Their diverse backgrounds help provide a synergism of ideas and perspectives, a wider range of views, and focused depth. Their connections and networks provide the team with access to experts and resources that enhance the research in ways that might not otherwise be possible. Problems and issues in the design and conduct of the research can be comprehensively identified and solved. Individual team members can expand their research skills through exposure to a wider spectrum of paradigms and methodologies. Finally, interdisciplinary research teams can more broadly disseminate research findings and related issues to the scientific community.

Interdisciplinary research teams also have some disadvantages. Many of the issues that arise in any group effort occur in interdisciplinary research. These issues include leadership capability and style, opportunities for group members to be heard, conflicting views and styles, lack of clarity regarding roles and responsibilities, workload assignments and follow-through, lack of trust, communication problems, and competing personal or professional agendas. Additionally, interdisciplinary research teams may pose some unique challenges. Pre-existing professional issues can become exaggerated, for example, when a "caste system" develops in which one discipline "looks down on" another (Prescott and Browne, 1985). A second challenge is that disparate philosophical and research paradigms may arise and even clash, causing misunderstandings about world view, methodologies, and areas of concern within disciplines. A third unique challenge is a potential for conflicting traditions of authorship (King et al., 1997). Such conflicts can present numerous problems to members of the research team as they attempt to make decisions about authorship on papers and presentations resulting from the research. Finally, when some members of an interdisciplinary team are located in geographic regions scattered across the country, communication across space and time is challenging. These disadvantages and unique challenges, however, can be dealt with by an interdisciplinary research team that is well organized and conducts itself in a democratic manner.

BUILDING THE TEAM

Perhaps the most important component of building an interdisciplinary research team is selecting the disciplines to be involved. There are several ways to accomplish this task. The conceptual or theoretical framework guiding the research may suggest relevant disciplines (McGuire, 1999). If the research problem involves a specific clinical issue, disciplines involved in diagnosis and management of the problem may be appropri-

ate. Funding agencies that publish announcements regarding available grant funds will sometimes suggest disciplines appropriate for studying the problem. Other criteria that should be considered in selecting disciplines for the research team are that each discipline should: (1) have an interest in the topic and a legitimate role in the project, (2) provide a particular area of expertise that is relevant to the topic, and (3) have a specific and unique contribution that complements expertise or contributions of other disciplines.

Once relevant disciplines have been selected, the investigator invites members of those disciplines to join the team. Again, several criteria are important. First, each member should have a demonstrated track record with the topic, which can help not only with grant writing but with the conduct of the research. Second, the individual should have a genuine interest in the research problem and a commitment to participate in the project. Third, the most effective team members are those who have demonstrated their ability to collaborate with others in a meaningful way. Fourth, it is helpful if potential research team members are able to articulate their own ideas and potential contributions so that the investigator can visualize the specific role each might have within the team. Another important criterion is an ability to switch easily between leader and follower roles. Why? Because although a team has a recognized leader, certain issues may arise that require the expertise and leadership of another member to resolve. A team comprised of members with this ability creates an environment in which all contribute at various levels and in various ways. Effective team members are also those who can garner support that enhance the research from peers, superiors, their own organizations, and other sources. Finally, a very important criterion is a personality type that is easy to work with, enthusiastic, creative, and optimistic. This style helps members interact well and deal with challenges faced by teams.

When a new investigator approaches individuals to join a research team, it is helpful to be able to clearly, comprehensively, and confidently describe the projected program of research and contributions that various disciplines can make. It is also wise to commit goals and aims to paper, even if tentative, for this can ensure a standard approach to prospective team members and lay a foundation for subsequent discussion. Important in this discussion is for the investigator to articulate the benefits to be derived from participating in the research.

An example of an interdisciplinary research team from the author's research program is shown in Table 2 (McGuire et al., 1998), which depicts details of the study, primary and secondary aims, and specific contributions

TABLE 2. *Example of an interdisciplinary research team*

Title: Nursing interventions for acute oral pain and mucositis (NIH, NR03929, 2/1/95-1/31/99)	
Primary aim	To test the effects of a nurse-administered psychoeducational intervention on severity and duration of acute oral pain and mucositis, use of cognitive and behavioral coping strategies, and emotional distress in patients receiving high dose chemotherapy as preparation for bone marrow transplant or leukemia treatment
Secondary aims	To explore the integrated and interactive contribution of six dimensions to the experience of pain To examine effects of the intervention on various components of the six dimensions To examine relationships between pain-related biological markers and clinical measures of acute oral pain and mucosal tissue injury
Methods	Experimental design with an intervention group and a control group; baseline measures and repeated measures of outcome variables for 21 days after conclusion of high dose chemotherapy or until discharge, whichever occurred first
Disciplines and contributions	Nursing: symptom management, patient education, coordination and oversight of study, interface with other care providers Dental medicine: pathophysiology of oral complications; oral assessment, diagnosis, and treatment; saliva collection and laboratory analysis Biostatistics: study design, data collection and quality control, statistical analysis and interpretation Transplant medicine: high dose chemotherapy and transplant diagnosis and management of treatment and illness complications Pharmacy: drug preparation, dosing, adverse effects, and interactions (antineoplastics, analgesics, antiemetics, antimicrobials, etc.) Psychology: cognitive and behavioral interventions, psychosocial issues Immunology: immunologic mechanisms in patients receiving immunosuppressive cancer therapy, biologic markers, and laboratory assays, interface with clinical science

of the disciplines represented on the team. The conceptual framework guiding the research, a multidimensional conceptualization of pain (McGuire, 1995) was used to construct the interdisciplinary research team (McGuire, 1999). The disciplines represent a range of clinical and basic sciences that make mutually complementary contributions.

MAINTAINING THE TEAM

Recognizing and proactively dealing with disadvantages and challenges contributes significantly to successful maintenance of a team. If the leader is not experienced in building and maintaining a team, advice from an experienced individual is extremely helpful, especially if this person is also a team member who is willing to serve as a mentor. The team leader needs to be open to views of others and practice a democratic process of leadership with consensual decision-making

(Williams, 1987). The ideal environment is one in which conflicting views can be aired, discussed, and resolved. Similarly, it is important that roles and responsibilities of team members be clearly identified and agreed upon by all. Members can then accept responsibility and carry out their assignments in reasonable timeframes, and with appropriate accountability.

Communication is an extremely important component of working with an interdisciplinary research team. The leader must be diligent in ensuring that open patterns of communication exist, that opportunities are provided throughout various aspects of the project for each member to participate, and that team members are kept aware of the project's status. Competing personal and professional goals can result in power struggles when individuals accustomed to making decisions attempt to override the group's desires or impose their own will on others. In such situations, strong leadership and a democratic process will help. When these various challenges are dealt with openly and successfully, team members gradually develop trust in the leader, in each other, and in the team itself.

A brief discussion of selected challenges and solutions from the example study in Table 2 may be helpful for investigators embarking on building an interdisciplinary research team. First, to deal with the challenge of conflicting views and agendas, the group defined and agreed on two major goals: (1) development of a program of research focused on oral complications in cancer patients, and (2) improvement of clinical care for patients. Defining these goals helped focus the team's agenda and guide subsequent activities. Second, to accommodate varying personal and professional goals, team members identified their own goals and shared them with the group. For example, some members of the team wished to launch their own individual research programs based on work resulting from the study, while others simply wanted to participate in and learn more about the research process.

Workload was a third major challenge because the study involved a complicated intervention and collection of various types of data within a longitudinal repeated-measures design. This challenge was dealt with in part by defining the workload, which included identification of different tasks, and reaching agreement among members on roles and responsibilities. A protocol entitled "Study Steps" was developed that delineated roles and responsibilities and gave specific instructions for carrying them out. A fourth challenge was acquisition of human, methodologic, and facility resources important to the conduct of the study. Solutions were usually achieved when various team members obtained access

to resources available to them through their own networks, departments, or institutions. As examples, dental medicine co-investigators arranged for specific laboratory resources essential in preserving and analyzing biological markers in patients' saliva samples, and linked the team with an oral medicine expert from another institution to adapt and test an instrument for measuring oral complications.

A fifth, and very important challenge, was the potential for conflicting traditions of authorship. Team members developed and mutually agreed upon a specific set of policy guidelines for determining the topics of papers and presentations to be generated from the study, procedures for deciding on primary and co-authorship, and mechanisms for settling disputes or failures to complete assigned responsibilities. These guidelines were based on accepted professional standards for conducting research and publishing scholarly works (Scientific Integrity Committee of the Midwestern Nursing Research Society, 1996; International Committee of Medical Journal Editors, 1997; King et al., 1997). The guidelines have helped the team determine important manuscripts, identify authorship teams, and develop mechanisms for disseminating results that have worked smoothly and are in concert with ethical publishing practices. Finally, the team had to deal with communication challenges across time, space, and geography because some members were located in other regions. Use of electronic mail, telephone conference calls, and careful preplanning when important topics needed to be discussed helped the team function effectively.

Maintaining an interdisciplinary research team and achieving success in the research endeavor involves several important components. First, not only should team members be those who work easily with others, but they also must be willing to think "outside of the box," that is, be open to the opinions of others and willing to consider alternative approaches. Second, it is important that the team have clear leadership by a leader who is willing to make difficult decisions when needed and members who respect this process. Third, as noted earlier, it is important that all viewpoints be heard and respected. Although open and democratic discussion can be challenging at times, it is essential. Next, the team needs clear goals and activities that are agreed upon by all members. Reaching consensus can be time consuming and frustrating for some team members, but can ultimately solidify the team and enhance commitment to the research.

Additional components of maintaining successful teams are related to how the team accomplishes its work. A group process for identifying and resolving issues is

extremely important and can be accomplished through regularly scheduled team meetings. Group celebrations of significant events (birthdays, acceptances of papers) are another important (and fun) mechanism for solidifying a team. Members need to recognize that building and maintaining a team is an incremental and longitudinal process that takes time. Similarly, development of trust and honesty among team members also takes time. The wise leader will invest a significant amount of energy to ensure that these outcomes occur. When a team becomes an effective group working toward common goals, it begins to view itself as a resource for future research endeavors such as the next study or a foundation for an expansion when some members want to address new issues.

Interdisciplinary research teams that have remained intact over time tend to be composed of strong, productive, and trustworthy individuals who are working toward common goals and who enjoy working together. The atmosphere is one that is open and collegial, with contributions made by all levels of personnel and all disciplines. Successful teams provide numerous opportunities for interdisciplinary mentorship, for example, each member can learn about issues and methodologies of other disciplines in a way that enhances personal and professional development. Finally, team members may identify new directions and new collaborative endeavors, thus leading to expansion of the team or development of new teams.

CONCLUSION

Interdisciplinary teams in Alzheimer disease research have the potential to explore more facets of a given research problem than teams that are not interdisciplinary in nature. Such teams also have the potential to produce better science and to disseminate results to a wider spectrum of relevant groups. Interdisciplinary

research teams may also be more successful in achieving funding, and are stimulating and growth-enhancing for members. Although investigators will find building and maintaining these teams to be a complex and challenging process, identification and proactive resolution of challenges is essential. Important elements of success include a democratic group process, good communication, common goals, and achievement of team members' personal and professional goals.

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