University of Michigan
Health System

Recommended Guidelines for International Collaboration in Translational and Clinical Research

Based on Findings from Research on UMHS-PUHSC Joint Institute during October 2010 - December 2011

Airong Luo
Margaret Ann Murphy
Ted Hanss
Joseph C. Kolars
Amy Huang

Acknowledgements

A special note of thanks to Director Qiudan Sun, Dr. Yanfang Wang, Dr. Weiwei Du, and our many colleagues in the JI who helped inform this report.

A special note of thanks to Dr. Joseph Kolars and Dr. Amy Huang for reviewing this report.

Contents

Recommended Guidelines for International Collaboration in Translational and Clinical Research

Based on Findings from Research on UMHS-PUHSC Joint Institute during October 2010 - December 2011

Introduction

Thanks to the Internet and advancements in technology, we are all part of an ever-shrinking globe. This is true for translational and clinical researchers as much as anyone. Translational research benefits from a multi-disciplinary, collaborative team approach to adequately "translate" basic and applied research such that it becomes available to patients as quickly as possible. Thus, movement toward international collaboration to hasten those outcomes, thereby bringing relief to patients worldwide, is a natural and fitting progression.

Whether you will be leading an international collaborative research team or expect to participate in one at some point down the road, it would serve you well to become familiar with the success indicators of such a collaboration, as well as potential pitfalls that can waylay the best laid plans. International collaborative research is a grand idea, but *change* is fundamental to the process, such as change from an autonomous mindset to a team perspective, change in how data is collected and stored, and change in how inter-personal, not to mention cross-cultural, issues are handled, to name a few. As much as we humans love the idea of progress and innovation, we are equally resistant to change. It is the tension between these two dynamics that make up the primary challenges you can expect when entering into cross-cultural research. Another facet of human nature is that we tend to be myopic in our worldview, assuming daily that others see the world as we do, certain that they share our same motivations, expectations, and notions of success. There is an ancient tale from India about seven blind men touching an elephant, all convinced of their own truth. "It is a rope," cried the man touching the tail. "No, a fan," said the man touching the ear. "No, no, you are all wrong," shouted the man touching the foot. "It is clearly a pillar!" They were all wrong, and they were all right. They just didn't have all the

As much as we humans love the idea of progress and innovation, we are equally resistant to change.

information. Imagining each researcher to be one of those blind men, we can only hope for them to discover something as awe inspiring as an elephant when they collaborate to discover the whole of their individual research paths. Thus, it is clear that despite the hurdles inherent in working across continents, there is too much to be gained to not make the effort.

Thus, it is clear that despite the hurdles inherent in working across continents, there is too much to be gained to not make the effort.

The field of translational research is relatively new, but the concept of research labs working side-by-side, albeit virtually, is even newer. Therefore, this document *Recommended Guidelines for International Collaboration in Translational and Clinical Research* has been designed for future collaborative researchers and/or leaders such as yourself to offer guidance as you proceed on your path. The insights provided for you in this guide are based on the research findings that have come out of the Joint Institute (JI), a *virtual* organization[1] between the Peking University Health Science Center (PUHSC) and the University of Michigan Health System (UMHS).

Background of the Joint Institute

Having insight into the potential benefits of international partnerships, UMHS and PUHSC both began looking for the right research institute to collaborate with a few years ago. This led to an agreement between the UMHS and the PUHSC to establish the Joint Institute (JI) in 2010, a virtual international translational and clinical research platform destined to facilitate high-impact, collaborative research to advance global health. The Joint Institute is also positioned as a working model for those eager to launch a similar type of international collaboration project.

When the UMHS started surveying the globe for ideal partners several years ago, China stood out for a number of reasons. It has a large aging population in urban areas, the government has implemented robust new health policy reforms, and China is regularly increasing its investment in biomedical research[2]. Until now, however, foreign universities have found it challenging to build sustainable, in-depth collaborations with China because there has been no shared institutional infrastructure to enable researchers to transcend cultural, regulatory, and technological boundaries. The leaders of the JI rallied to this challenge, however, and have forged a "work in progress" organization that has taken all these factors into account.

---

1 In Cummings, Finholt, Foster, & Kesselman (2008, p. 3), a virtual organization is defined as "a group of individuals whose members and resources may be dispersed geographically and institutionally, yet who function as a coherent unit through the use of cyberinfrastructure (CI)."

2 Wang, Wang, & Marincola (2011)

Methods Used to "Map Out" JI's Success Factors and Challenges

International scientific collaborations often succeed or fail because of the strengths or weaknesses of the collaboration process. Fortunately, the social science of collaboration provides tools that enable us to analyze "what works" in scientific collaboration. This goal is achieved by analyzing patterns in social relationships that comprise the otherwise "invisible" work that goes into forming and maintaining scientific collaboration over the long term.

The founding members of the Joint Institute knew they needed a team in place from the beginning to anticipate challenges posed by such a collaboration and to offer advice to leaders, project managers, and researchers on the spot as soon as they encountered a challenge. To that end, they established the Collaboration Core, one of three groups designed to keep things running smoothly. The Collaboration Core conducts ethnographic research to understand cultural differences, disparities in research practices, communication difficulties among researchers, and challenges in project management.

The driving questions behind the Collaboration Core's initial research were as follows:

1) What management structures and processes lead to a sustainable and successful cross-institutional collaboration platform?
2) How are information technologies incorporated into the collaboration platform, and how do these technologies shape JI processes and procedures?

What follows is a summary of their methods and findings. You should find a rich source of tested concepts regarding how best to leverage leadership and information technologies for favorable outcomes.

The Collaboration Core adopted several qualitative research methods to analyze JI collaboration at three broad levels: the meta-issues (measurement and evaluation), the collaboration and "nuts and bolts" level (collaboration structure and context, characteristics and dynamics of research teams), and the support level, which looks at institutional support, management, and organization for collaboration[3]. They conducted thirty-two half-hour interviews with leaders, project managers, and investigators to study their speech and behavior and how they related to one another, especially regarding similarities and differences in work processes, as well as the social and technological processes involved in international collaboration formation. They also observed conferences and ceremonial occasions and examined documents produced by the JI such as articles, meeting agendas, and minutes. Systematic analysis of interviews, observations, conversations, documents, and investigators' field notes provided them with direct evidence of the social processes in which participants engaged during collaboration. The summary of success factors below came out of this research.

---

3 This is adapted from Falk-Krzesinski, Hall, Stokols, & Vogel (2010).

Building Blocks of Successful International Research Collaboration

It may be surprising to discover just how much goes into the making of a successful international collaborative project. If you are charged with launching a similar enterprise, hang in there, and know that you are not alone. Having already swum a lap in these "foreign" waters, the JI is eager to share what they have learned to encourage and inspire others like you to do the same. This document provides a collaboration model, outlining the most important things you need to know both at the institutional and individual team level before you take the plunge. Each of the following concepts will be developed with examples to provide an overview of the path to successful international research collaboration for translational and clinical research, along with a section at the end to address typical challenges and offer solutions to those challenges.

Institutional Level Success Factors:

- Equal commitment to funding
- Strong, committed leadership
- Sustainable, cross-institutional human and technical infrastructure
- Sustainable core support infrastructure within partner institutions
- Clear, shared understanding of expectations, goals, and criteria for measuring success
- Matching of investigators with similar research interests
- Offering of systematic training
- Fostering of cultural competency
- Sharing and documenting of collaboration experiences
- Engagement of boundary spanners

Individual Team Level Success Factors:

- Engagement of researchers with previous multi-center collaboration experience
- Investment in project management
- Data quality control

Section 1

Strengths that Support Collaboration at the Institutional Level

What follows are the JI's research outcomes for the types of protocols, actions, and attitudes that best support collaboration at the institutional level.

The Importance of Equal Funding

When it comes to building a solid business partnership, nothing speaks louder than putting your money where your mouth is. Not only does this build trust, but, more important, it gives each partner an equal say in how things roll out. This balance of power maximizes commitment on both ends and makes all the difference when it comes to problem solving, sharing resources, and putting in the passion (and overtime) necessary for such a project to thrive.

Overall, the JI facilitates collaboration in myriad ways, including strong leadership, but the most critical success factor has been that both institutions invested an equal amount of funding. Leaders and researchers from both institutions felt that when both parties take equal risks, financially and otherwise, the possibility of equal benefits is greatly enhanced.

Leaders and researchers from both institutions felt that when both parties take equal risks, financially and otherwise, the possibility of equal benefits is greatly enhanced.

The previous funding model for international collaboration has often relied on one country providing more of the resources to help develop the resources of another. The outcome of this arrangement usually leads to a lack of commitment on the part of the emerging country's institution and a tendency for the institution from the developed country to impose their own agenda. The JI, however, has a unique arrangement in that each institution committed $7M dollars. This equal investment of funding has resulted in an equal investment of time and effort to work through differences that might have crippled other collaborations. This equality is also reflected in the organizational structure of the JI. There is one co-director from each institution, along with three research programs and three research cores, and each program and each core has a co-lead from each institution.

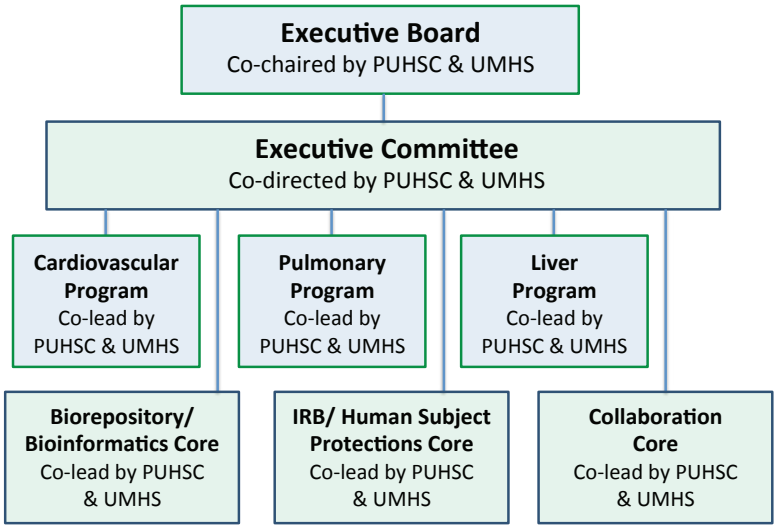

Figure 1. JI Organizational Structure

Strong, Committed Leadership

The second most important factor to help you be successful in your international translational and clinical research collaboration is strong and committed leadership. Ideally, you want your leaders and project managers from participating institutions to display the following characteristics:

- Deep commitment
- Open mindedness
- Flexibility in management
- Open sharing of cross-cultural experiences
- Passion to collaborate with the partner country's institution

The JI leadership has demonstrated each of these characteristics right from the beginning and continues to draw on them daily.

Despite many other US universities pursuing collaboration with PUHSC, one of the reasons UMHS was selected was because its leaders demonstrated commitment and cultural competency, ardently practiced communication, and made frequent in-person visits. Another key reason PUHSC chose UMHS was because UMHS came with concrete strategic plans in hand for how to implement collaboration. The UMHS JI leadership visited four potential partners in China but chose PUHSC, in part, because it has a highly ranked medical school in both research and health care and abundant clinical resources, but mostly because of the their willingness to invest equally coupled with their commitment to quality leadership.

Attitude Is Everything

For collaboration to be successful, it is of the utmost importance that both leadership teams work on individual issues with an open mind while keeping the final goal of accomplishing work for the shared good front and center. If one partner comes up with a new request or new area to discuss, the other partner should be willing to consider it. If timing is an issue, leaders can address problems immediately or delay discussions until a later time when there is more information. A collaborative attitude makes working together feasible. All team leaders at the JI have demonstrated positive attitudes by being willing to work through obstacles as well as being open to new research ideas.

Another key characteristic of strong leadership, in addition to open-mindedness, is flexibility. Despite efforts to take all aspects of such an enormous project into consideration, there are bound to be numerous divergences along the path that require on-the-spot decision making. Since this is a pioneering effort, there is little in the way of benchmarking to turn to for answers to pressing questions. Such groundbreaking collaborative work requires flexibility of mind to allow for switching gears or devising altogether new paths when confronted with an obstacle. The leadership of the JI has demonstrated such flexibility on an ongoing basis.

Another key characteristic of strong leadership, in addition to open-mindedness, is flexibility.

Flexibility Pays Off

The JI leadership was given a $14M ($7M from each institution) budget to meet the needs of all the research teams. One researcher proposed a cohort study that would require a $6M investment, nearly half the total budget, explaining that it would result in high-yield outcomes. Seeing the great potential of developing a cohort study, the JI leaders maintained their open-mindedness and flexibility to reach a compromise rather than reject the higher budget request outright as being unfair to the other teams. The JI leaders and project managers worked with the research team leaders to develop a feasible plan and budget, even though the study was started a year later than anticipated. Given the complexity of the cohort study, this was a huge accomplishment for all involved.

Leadership Experience in Each Other's Countries

Another factor that can have a big impact on the success of your program is if your leadership teams have had travel and work experiences in their partnering countries. It turned out to be extremely important to the success of the JI that many of their leaders and project managers had research experience in each other's respective countries, thus allowing them the opportunity to develop the cultural competency needed to overcome barriers brought about by cultural differences.

Cultural Competency – Key Factor for Leaders

The professional reputation of the UMHS co-director of the JI preceded his introduction to PUHSC leadership. He had had extensive international experience leading global health initiatives in Africa and China, including working with the Bill and Melinda Gates Foundation and sitting on the Chinese medical board of the Rockefeller Foundation with a former leader from PUHSC. This co-director had also been asked to start a western style health system in Shanghai where he lived and worked for three years. In addition, he had made a positive connection with the former leader of PUHSC's international office when they attended a conference together in Ghana. All this experience contributed greatly to him gaining the trust and respect of the PUHSC leaders, as well as understanding how best to approach them on their terms.

Identify Team Leaders with a Passion to Collaborate with the Partner Country

Ideally, in addition to team leaders having cross-cultural travel and work experiences in the other country designated in the partnership, you also want to target project leaders who have a passion for such collaboration. These leaders are best positioned to select researchers who share that same passion. Individual passion can be a driving force to help others hang in there and work through the tough spots. It can also be the source of endless creativity and inspiration. Passion may stem from one's own ethnicity or from shared experiences that motivate individuals and research teams to expend the extra effort, time, and expense that collaboration across cultures and continents requires.

Passion Goes a Long Way Toward Success

Dr. L., a Principal Investigator, was born and grew up in Hong Kong and received her resident training in the UK. She worked as a clinical researcher for over twenty years in the US. Dr. L. remarked that international collaboration for translational and clinical research is more inconvenient and time consuming than non-collaborative lab research because of the time differences between countries and having to overcome various organizational obstacles, but her passion to collaborate with Chinese researchers motivated her to overcome such barriers.

Awareness of Cross-Cultural Differences in Leadership Models

Another factor for you to be aware of is the difference in leadership models between cultures. Learning about another country's leadership styles and having open conversation beforehand about how to maneuver through these differences is always recommended. For example, the leadership model in some countries is more authoritarian and hierarchical. Compliance is expected and a questioning of authority may more likely be seen as insubordination coupled with disrespect. In a hierarchical model of leadership, it is important to engage the leadership

first when starting new initiatives before sharing concepts with other team members or taking any unauthorized action. The model of leadership in the US is also hierarchical, but there is more room for collegial disagreement and questioning of the status quo, as long as it is done respectfully. In fact, those who do speak up to challenge the status quo are often seen as bright, assertive, and strong minded — heroic, if you will. Even if leaders don't always like their authority to be questioned, especially in public, it is not unusual that the one speaking out earns the begrudging respect of his or her "elders."

Another example of varying management styles across cultures is the degree to which leaders or managers are involved in the day-to-day decision making on the part of the researchers. In some cultures, management has a history of keeping very close tabs on the progress and/or the budget of their researchers, whereas in other cultures, management has more of a hands-off approach, allowing researchers more autonomy. Offense can be taken if researchers are used to having a lot of autonomy and suddenly they are asked to document their actions or defend their decisions in detail. Unfortunately, they may interpret this to mean that the new management does not trust their level of competency, whereas that may not be the case at all. For example, the management may simply need to be consistent with institutional requirements. Some of the areas that clearly raise questions regarding varying management styles include travel (e.g., details such as which class to book for air travel) and criteria and rules regarding funding, authorship, and data and sample sharing. It is recommended that the management teams and leaders from the participating institutions establish policies and guidelines regarding such areas ahead of time in order to balance the needs of both the management and the researchers.

Developing Sustainable Cross-Institutional Human and Technical Infrastructure

Part of strong, responsible leadership involves putting infrastructures in place to prevent fires and to provide a process to follow should they occur. Just as the JI's Collaboration Core was developed to further understand the science of collaboration, two other supportive groups were developed as well. The Bilateral Institutional Review Board (IRB) Core helps researchers understand the ethics review processes within the two institutions and expedites the steps to successful IRB filing. The Biorepository/Biomedical Informatics Core (BRBI) establishes and maintains a standardized process for securing and storing biological specimens and clinical data. These dedicated research cores assess the needs of the administrative, management, and technical infrastructures in a timely manner and are a must to keep things flowing smoothly. It is recommended that future leaders of international collaboration projects consider creating teams such as these cores and having them in place before the launch of any actual research.

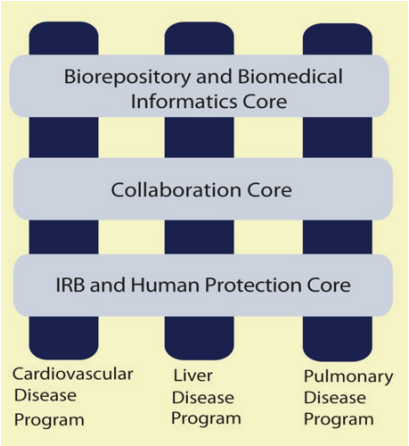

Figure 2. JI Research Cores

BRBI Core's Support for Research Teams

After much searching, the Biorepository/Bioinformatics Core (BRBI) selected OpenClinica as the JI's first data platform because it was customizable to the JI researchers' specific needs. They then formed a system development team, consisting of a web developer and a database expert, to collaborate closely with the researchers. For example, in order to enhance data quality control, researchers specified variable parameters to the system development team. The system development team then set up ranges for data entry so that if values outside those ranges were entered, the system either presented a warning message or requested another data entry. Coming up with this solution together required high-level communication skills such as deep listening, careful analysis, and thoughtful explanations, but they achieved their goal of enhanced data quality control by being willing to stretch outside of their comfort zones.

Developing Sustainable Core Infrastructure within Each Partner Institution

If you feel overwhelmed by the sheer volume of tasks that need to be fulfilled to launch and maintain an international research collaboration, take heart — you're in good company. The bottom line is that there is far too much for a handful of leaders and managers to handle. Thus, it is necessary to leverage existing staff and engage support services and resources within the respective institutions. Just as the JI developed the three cross-institutional core groups, it is highly recommended that each individual institution develop its own *sustainable* internal human infrastructure[4] to support researchers' participation in international collaboration. A virtual organization like the JI should engage departments and sections within each partner institution and have them set up a routinized collaboration process to work together. If such infrastructure is in place, project leaders will find it much easier to coordinate and maintain the support of various departments and sections on an as-needed basis. The following diagram shows identified project management tasks at PUHSC and how their internal departments lend support collaboratively.

4 Human infrastructure is defined by Lee, Dourish, & Mark (2006, p. 491) as "the arrangements of organizations and actors that must be brought into alignment for work to be done."

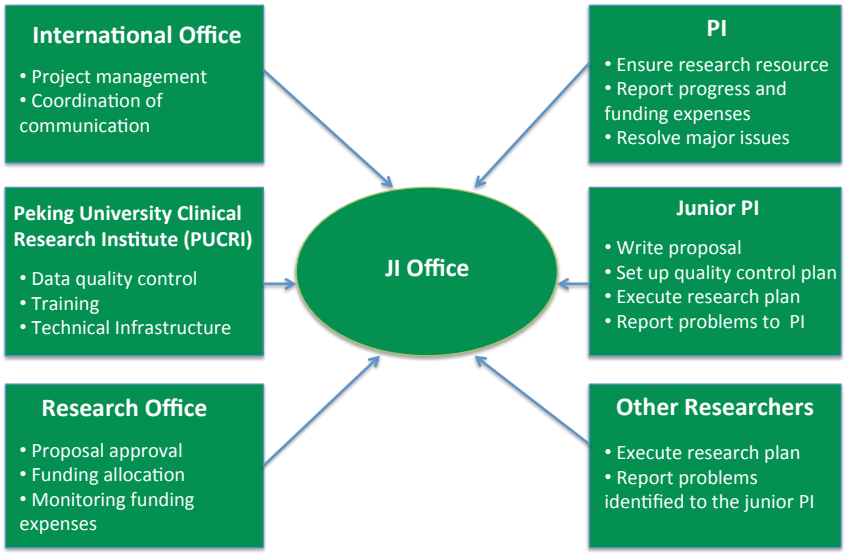

Figure 3. PUHSC JI Management Plan

Understanding Expectations, Goals, and Criteria for Success

Just like in any relationship, the key component to avoiding conflict and ensuring mutual satisfaction between partners is to understand and clarify each other's expectations and goals. The JI took the time to understand each party's expectations, in particular, regarding access to patient study populations, laboratory equipment and facilities, technology, software, administrative and support personnel, professional training resources, communication and data analysis and to talk about what the notion of success means to each party. The JI leadership team worked hard to explore these questions, but when conflicts did occur, those involved reported problems to the JI leaders and the management team who helped resolve the misunderstandings. Leadership and investigators agreed that success measures for the JI included the following (though not necessarily in this order):

1) Publishing in peer-reviewed journals
2) Expanding research projects that bring in outside funding
3) Developing a platform for sustainable collaboration down the road
4) Training of junior translational and clinical researchers

It may not always be obvious to the leaders involved in a collaboration project why it is important to take the time to explicate each group's criteria for success. At first glance, it seems obvious. All involved are coming together to find research outcomes that will help bring health and healing to the suffering people of the world. But the truth is that leaders and researchers of different organizations often have different motivations for involvement, beyond the big picture desire to better the world, and different criteria for success. And if they do share the same criteria, they might put them in a different order of importance. Getting these differences out on the table is critical for moving forward with clarity and ease.

Clarifying goals and motivations also enabled the JI management to understand how to measure and evaluate the success of the JI. For example, the primary motivation of the UMHS is to complete research and publish it in order to generate continuous grant funding. In addition to that goal, the PUHSC's primary motivation, however, also includes providing training for the next generation of physician scientists. Both are good; both are needed. They are just different. Thus, metrics for success should be discussed and agreed upon in advance as well as parameters for resource sharing so that the research can be completed without delays caused by differences in expectations.

Identify Common Interests of Partner Institutions

Part of clarifying expectations, goals, and measurements for success is discovering what the various collaborating institutions have in common. Should your leaders discover that they do, indeed, have unique visions for success, knowing each other's mission is a critical piece of the negotiation process. The leadership of the JI took the time to discover their common interests and then used them as the cornerstone of the entire collaboration.

Foundation Built on Common Interests

The UMHS leadership and some professors visited PUHSC before the JI was launched to discuss their common interests, which led to the formation of task forces based on three research programs: cardiovascular, liver, and pulmonary. These common interests were reinforced by each institution making an equal funding investment of $7M each along with the willingness to share complementary resources such as science, technology, patient populations, laboratory expertise, and facilities. Then the leadership identified Principal Investigators (PIs) who had extensive research experiences in clinical and translational research for the different research programs. At the UMHS, the management team discussed with the potential PIs why they would collaborate with China and what they could offer to their potential Chinese partners. Then the leaders went back to PUHSC and shared notes from their discussions at the UMHS with the PUHSC leadership. Based on this discussion, the leadership from both institutions came up with the structure for the JI, the three programs, the three cores, how they wanted to govern the JI board and executive committee, and who should be the lead.

Matching Investigators with Similar Research Interests

Identifying compatible research partners constitutes one of the major challenges faced by translational and clinical researchers[5]. It will also greatly serve your collaboration to make the effort to match up investigators who hold similar research interests and goals. The JI leadership and project managers did so, but also helped investigators from both universities further identify common research goals and build relationships by sponsoring and facilitating joint symposia, site visits for the investigators, audio and video communication, and the exchange of trainees.

---

5 Luo, Zheng, Bhavnani, & Warden (2010)

Teams Built on Common Interest

In keeping with the spirit of equality and mutual benefits modeled by the founders of the JI, the two leaders of the JI Pulmonary Project determined right from the start that their collaborative research would require equal investment and provide equal benefit to both labs. They compared notes and found that both were fascinated and inspired by the idea of studying the respiratory microbiome of Chronic Obstructive Pulmonary Disease (COPD). Not only was COPD a disease of increasing concern to both the US and China, but the resources provided by the JI would allow their research to remain sustainable for an extended period of time. Thus, an ideal team was born because both researchers were excited and passionate about what lay before them.

Offering Systematic Training

Just as it will strengthen your program and increase investment on the part of your researchers to be paired up with other researchers with similar interests, your researchers will also benefit by being matched up with training that is appropriate for their needs. Below are some suggestions to increase the effectiveness of your training:

- Identify disparities in the skill sets of individual researchers
- Design formal, generalized group training on clinical research topics and project specific, hands-on training in individual labs based on the identified needs
- Identify resources and opportunities for training outside the JI, document the resources, and make the information available to all participants
- Evaluate each training program in order to better understand training needs and improve the design of training programs

Programs for international collaboration can include:

- Research skills
- Understanding the partner institution's research culture
- Team building
- Regulations on conducting clinical research, including:
  - ethical reviews
  - informed consent
  - transferring genetic data across countries

Benefits of Clinical Research Training

With the help of the Michigan Institute for Clinical and Health Research (MICHR), the JI sponsored a two-week training program for nineteen PUHSC researchers in April of 2011. Most of the trainees were junior researchers. The trainees reported that in addition to training on clinical research skills, the program raised their awareness of the JI mission and the importance of teamwork, enabled team building, and increased team efficacy. In July of 2011, junior PUHSC researchers also participated in a one-week training program offered by Peking University Clinical Research Institute (PUCRI) with a focus on clinical research skills.

Benefits of Lab Specific Training

Collaborators in two project laboratories in the cardiovascular group were the first to sponsor trainees from PUHSC at UMHS laboratories. This was especially helpful in training researchers on standardized skills in sample collection, processing, and laboratory analyses. Investigators from the PUHSC also reported that being exposed to the daily practices of UMHS' labs broadened their view and inspired their research ideas. A UMHS investigator believed that such visits enabled researchers to be immersed in a different culture and offered encouragement for more culturally reserved study staff to "speak up" to PIs and their foreign collaborators about potential problems.

Fostering Cross-Cultural Competency

Trying to work collaboratively in a virtual universe has many challenges. One of them is blindly trying to "feel out" the culture of the partner's lab environment. To address this, the JI offers relevant training programs, such as one on clinical research culture, but even more important, UMHS offers junior investigators the opportunity to become familiar with their partner's research culture by taking tours of laboratories and other facilities and by visiting with JI leaders and investigators in their workplaces and homes. An ongoing exchange program for investigators to visit or train in UMHS labs — from a few weeks up to a year — has begun so that they may spend time with their counterparts in their work sites and better understand their actual working environment.

An ongoing exchange program for investigators to visit or train in UMHS labs — from a few weeks up to a year — has begun so that they may spend time with their counterparts in their work sites and better understand their actual working environment.

The ongoing exchange program for investigators to visit or train in UMHS labs facilitates the acquisition of cultural as well as scientific skills. JI members reported that when investigators and study staff from the US and China spent time in their partners' labs, they could better understand their collaborators' communication style. Consequently, their team communication improved.

The JI leaders and management work with individuals when they inevitably behave in culturally inappropriate ways. Leaders and management work with their partner institution's leaders and management to clarify any misunderstanding, explain to individuals why their behavior was inappropriate, and offer suggestions for improvement.

Sharing and Documenting Collaboration Experiences

Another important way to build trust and healthy collaboration is to keep the lines of communication open and to capture and share the experiences of all involved. Documentation is important because it saves the valuable time and energy of project managers and researchers and it facilitates a sustainable institutional memory so that when there is staff turnover, the newcomers can learn from the archived documents. The JI has accomplished this in a number of ways:

- *Website:* records and disseminates information about research awards, site visits, symposia, and JI news
- *Newsletters:* introduce individual researchers, disseminate news about funding opportunities, summarize individual team's research progress, etc.
- *Annual Joint Symposium:* allows for sharing project progress, successes, and ways in which challenges have been met
- *Executive committee meetings:* allow for Q & A, sharing of problems and successes, and encourage friendly competition
- *Reports:* summarize and analyze key components that make up collaborative accomplishments such as the Collaboration Core report

Additional items that are not yet documented by the JI, but would be helpful to have in such an international collaboration, include the following:

- How to transfer genetic research samples across international boundaries (who to contact at which national agency)
- Collaboration tools members found most useful to enhance collaboration effectiveness
- Funding opportunities for international collaboration
- Resources for applications to post-doc programs
- Knowledge investigators gain when visiting each other's research locations so that everyone in the larger collaborative organization can benefit from this knowledge

There are many and varied ways to capture information, disseminate it, and archive it for future reference. The bottom line is that effective documentation helps others from having to reinvent the wheel every time they face the same hurdle.

Designating Boundary Spanners and "Champions"

Boundary spanners are people who understand the cultures of the collaborating institutions and bridge the cultural and organizational differences among administrators, researchers, and staff[6]. They can also work in different languages, an important skill for international research. Basically, these people help make everything go more smoothly and provide a solid base of connection between the groups. Incorporating boundary spanners into your management team, individual research teams, and research cores can make all the difference in ironing out misunderstandings. Quite often boundary spanners also end up being the "champions" of an initiative in that they bring both *passion* and *experience* to help the team surpass challenges. Enlisting boundary spanners on both sides throughout the JI has made a significant contribution to their success.

Quite often boundary spanners also end up being the "champions" of an initiative in that they bring both passion and experience to help the team surpass challenges.

Boundary Spanners at Work

The project manager for UMHS, Dr. H., originally from China, is the ideal example of a boundary spanner. She was trained as a physician at PUHSC and then became a project manager at UMHS. She is bilingual and has a deep knowledge of both PUHSC and UMHS. Another boundary spanner is Dr. C., a research program leader who received his MD training in China and his PhD in the US and has been working as a professor in the US for a number of years. His cultural knowledge and professional networks in China enable him to play a critical role in advising the JI leadership as to which research programs to focus on and how to navigate among different organizational sectors in both institutions (e.g., who are the right people to contact) to solve different research and managerial issues. The junior PIs under this research program commented that their collaboration would have been much slower without Dr. C.'s guidance. Dr. L. is another research team leader, also a boundary spanner, who was born in Hong Kong, attended medical school there, and did her residency and fellowship training in the UK before coming to UMHS. Having worked with Chinese medical and scientific collaborators in the past, she understands the culture and ways of practicing medicine. And she has another boundary spanner on her team, Dr. F., who earned her medical degree and doctorate in China. Dr. F. is also bilingual and has been working as a study coordinator at the UMHS for many years. Together Dr. L. and Dr. F. wrote the original research manual in English, and after a bilingual collaborator at PUHSC translated the manual from English to Mandarin, Dr. L. and Dr. F. reviewed the manual's translation from English to Mandarin to ensure accuracy.

6 Levina & Vaast (2005)

Section 2

Strengths that Support Collaboration in Individual Research Teams

Up to now, we have been discussing success factors at the institutional level. Now we turn to the key factors that contribute to success at the individual research team level.

Engaging PIs with Previous Multi-Center Collaboration Experience

Just as boundary spanners can champion initiatives at the institutional level, Principal Investigators (PIs) with experience in multi-center collaborations can serve as your much-needed champions at the individual research team level. Principal Investigators can use their knowledge to strengthen every step in the research process from co-authoring research proposals to conducting research in the partner country to designing authorship agreements. Again, when you engage the right people with both passion and experience, there is much more likelihood of success when the inevitable challenges arise.

Tapping the Wisdom of Experience

Dr. L. from UMHS had rich experience in leading multi-center clinical research collaboration. She drew from her previous multi-center experience and inspired her team in different ways. For example, since her team was new and still getting their feet wet, she suggested that they focus on a small, feasible project that would still result in publication and future grant funding. She also shared her previous experience with authorship decisions, sample sharing and data quality control as examples for the current team to consider for their own work. Her experience helped her team avoid many pitfalls and take fewer detours.

Investing in Project Management

Trying to run an international collaborative research project without adequate project management can be challenging for all involved. Being independent by nature and training and being encouraged by the incentive structure in the academic world to show their independent contributions, researchers are bound to set off in their own directions. As well intentioned as they may be, there might be confusion among teams if they don't have a clear management plan. Consider for a moment how many different skill sets, career goals, and national and organizational cultures are involved. Now consider all of the varied resources distributed throughout each partner institution. Coordination is necessary to accomplish research tasks in

a timely manner and to prevent the project from becoming its own Tower of Babel. Thus, project management, which includes tasks such as planning, organizing, and coordinating is critical for research teams to achieve their scientific goals. Unfortunately, the importance of project management has not been widely recognized. Some tips for project management include:

- Designating specific project management responsibilities
- Setting up a communication plan
- Setting up agreements on authorship and data sharing

Team Level Project Management at Work

The Hepatitis C Virus (HCV) Project group formed two internal committees: the steering committee and the logistics committee. The steering committee determines guidelines and resolves conflicts regarding authorship, data, and sample sharing. The logistics committee is responsible for daily operations. After face-to face meetings at the early stage to establish a relationship and build common ground, the HCV group set up monthly videoconferences. Each participating institute is required to have a representative to participate in the videoconference. Monthly videoconferences enable researchers to maintain relationships, trust, and accountability. A study coordinator sends out an agenda one week before the meeting inviting all team members to contribute. At the meeting, each site reports progress and problems. Post-meeting minutes are then sent out to codify the content of the meeting and to reinforce next steps. This keeps all members in the loop. All meeting agendas and minutes are archived for future reference.

Ensuring Data Quality Control

With so many people going in so many different directions, working on so many different parts of the whole, there also has to be agreement on data validity and reliability, quality of work, and research ethics. It is critical to hammer out agreements in these areas, or the outcomes of the research may be unreliable. Below are some suggestions to help teams manage data quality control:

- Formal training programs on research skills
- Site visit and audit
- Regular communication between researchers regarding data quality and differences in cultural and laboratory practices
- Establishment of a collaborative research culture that enables people to feel free to ask questions regardless of their rank or status in the organization, to not withhold data, etc.
- Standardized bilingual research manual with agreed-upon definitions and procedural details
- Detail-oriented, hands-on training based on the research manual
- Ongoing monitoring of data collection and evaluation of data quality
- Third party monitoring of research process and data quality

Research Manual Designed to Standardize Processes to Ensure Data Quality

Researchers in the Liver HCV project worked tirelessly to complete a thorough, bilingual research manual. Soon after, however, they found a discrepancy between actual practice with patients and the manual. When patients in the US were asked about daily alcohol intake, most people understood the question, but when patients in China were asked about their daily alcohol intake, they were confused. Researchers pointed out that Chinese doctors must instead ask the patient to indicate how many bottles, or liang (Chinese measurement for liquor) they drink every day, and then convert the answer to milliliters. After this clarification, the researchers then made changes accordingly to their research manual. Another example has to do with major cultural differences between types of pickled foods people consume. In the US, the general term "pickle" is commonly understood, but in China there are over forty-two varieties of pickled foods, and no single term includes all items. Since an accurate assessment of patients' pickled food is part of the dietary assessment, the team from both universities came up with the solution of including drawings of Chinese pickled foods as part of the Chinese nutritional assessment in the research manual. Researchers remarked that it is important to include and standardize this kind of detail to ensure that all the researchers and staff members involved in data collection follow the same standard.

Monitoring Data Collection and Evaluating Data Quality

The Liver HCV research team holds monthly all-site videoconferences. During the monthly meetings, researchers report on the patient recruitment process, challenges in recruitment, missing samples, etc. Regular communication enables the partner institutions to be on the same page, identify problems in a timely manner, and solve problems by working together. The HCV researchers at PUHSC also use a data quality monitoring service offered by Peking University Clinical Research Institute (PUCRI) to monitor data collection and evaluate data quality on a continuous basis. In addition, the HCV group researchers visit their partners' lab once or twice a year for data quality audit. During the visits, source documents were checked against study data entry, errors were corrected and missing data points were retrieved and entered into the database.

Hands-On Training Helps Ensure Data Quality

At one point, researchers from the pulmonary group encountered a data quality issue with DNA extraction. They realized that the only way to resolve the issue was for them to work together side-by-side, so the UMHS team scheduled a visit to the PUHSC laboratory during the 2011 JI Joint Symposium time. The experienced UMHS researcher offered specific techniques to maximize the amount of DNA extracted such as laying a test tube flat rather than holding it upright on a vortexer and avoiding glass tubes because they may cause DNA to stick to the tube. To avoid contamination of sensitive samples, he also introduced extra procedures such as a warm water bath and radiating the opening of the test tube every time material was transferred. The only way the PUHSC researchers could have learned such valuable tips was through direct, in-person exchange with their research partners. Tips like these are not described in any written research protocol.

Section 3

Ongoing Challenges and Recommendations

Along with their many successes, the JI has encountered its share of challenges as can be expected of any project with such scope and complexity. Some of these challenges continue to present themselves, and some of them are in the process of being resolved. This section presents some of those challenges, offers suggested solutions, and asks relevant questions when solutions are not evident.

Need for Research and Administrative Support Staff

One of the biggest challenges you and your collaborative research partners will face is providing researchers with adequate administrative and research support staff. Not only does the lack of support staff raise serious questions as to the sustainability of collaboration over the long run, but it also constitutes a barrier to data quality control. These issues combined make the need for adequate research and administrative support staff an important issue facing the JI team today.

China's Current Research Structure

The lack of support staff is felt most acutely in clinical research teams. Clinical researchers in China have very heavy clinical responsibilities, which means most often that they can only perform research activities before or after long working hours. Ideally, each research team should have research coordinators to help shoulder the myriad tasks required to run a proper study. However, this role of a research coordinator is not common in Chinese reasearch teams. In addition to providing adequate research support staff, it is equally important to provide the teams with adequate "human infrastructure" to handle administrative, management, and IT tasks. Unfortunately, in China, there are a number of reasons why it is difficult to find and secure such staffing:

In addition to providing adequate research support staff, it is equally important to provide the teams with adequate "human infrastructure" to handle administrative, management, and IT tasks.

- Chinese funding agencies impose strict rules on using funding to hire additional staff.
- Most of the JI's junior PIs are on the clinical track, and their promotion packages require them to put in a certain number of clinical hours.
- The concept of a research coordinator is relatively new in China, so they do not have an adequately trained workforce from which to recruit.
- The study coordinator is not an attractive position for trained nurses in comparison to a clinical position because it tends to be temporary and project dependent.

Outcomes of Inadequate Staffing

There are a number of potential outcomes resulting from inadequate staffing:

- Overloaded project managers and administrative staff
- Overloaded clinical researchers result in:
  - reduced efficiency
  - lowered morale
  - reduction in data quality

These concerns have the potential to make or break a collaborative research project and deserve to be given serious and timely consideration. Below are proposed solutions by the JI and recommendations to immediately address these concerns, though they have not yet proved effective:

- Establish a training program to help nurses become trained research coordinators through a collaboration between U-M and PUHSC nursing schools.
- Establish a project management office in Beijing to deal with daily management and administrative tasks.
- Seek outside funding to fund some junior clinicians and release them from clinical work.
- Identify management and administrative tasks and delegate these tasks to existing departments.
- Routinize, document, and archive administrative and management procedures to provide:
  - a centralized location for people to get answers to FAQs, thereby saving researchers' and managers' valuable time.
  - sustainable institutional "memory" to help educate new staff when there is turnover.

Considering Short-Term Goals and Long-Term Goals

It is always a challenge to balance expectations for early productivity of individual projects and the need to build sustainable, cross-institutional technical infrastructure. Currently, the Biorepository/Biomedical Informatics Core works with the individual teams to address their immediate needs for technical support. It is still under discussion, however, as to how the JI technical infrastructure can be integrated with the existing institutional infrastructure. It also remains to be seen how IT support for the JI can be sustainable, that is, how IT support will not be affected by turnover in key personnel.

It is important for IT support to communicate with researchers regarding the benefits and necessity of setting up plans and standards for sustainable support.

It is ideal if you can get your teams to negotiate long-term plans and establish routine procedures for continuous support. It is important for IT support to communicate with researchers regarding the benefits and necessity of setting up plans and standards for sustainable support. For the JI, it is recommended that the JI should continue to work with the relevant IT departments at both institutions to accomplish these tasks.

Establishing Criteria for Proposal Evaluation

Another issue that you want to consider is setting up shared, agreed upon criteria for evaluating proposals. Sometimes honest misunderstandings between individual investigators and management may occur because the criteria for proposal evaluation has not been adequately discussed or agreed upon beforehand. Some investigators wondered why it was much more difficult to get project approval from one institution than another. The disparity in criteria also resulted in questions about research standards between institutions. In such situations, it is in the interest of your project for your management team to encourage and facilitate members of the proposal review committees from both institutions to agree upon evaluation criteria.

Managing Ethical Differences Across Cultures

The issue of differing ethics in different cultures is complex and has a legal as well as an interpersonal impact. People can have strong emotional reactions when they encounter value systems that are in stark contrast to their own beliefs. Your best bet is to expect such ethical differences and be prepared to openly discuss them. For example, the Chinese people's understanding of privacy varies a great deal from Americans. In China, it is not uncommon for two doctors to use the same examination room at the same time. Though this lack of privacy may be uncomfortable for the patients, it is a social and cultural norm. Everyone accepts this as a necessary reality. When ethical differences such as these arise, investigators can seek out management's help in bridging the cultural gap. Here are some of the typical ethical issues you may encounter:

People can have strong emotional reactions when they encounter value systems that are in stark contrast to their own beliefs.

- Informed consent:
  - individual versus family consent[7]
  - varying literacy levels of patients
- Privacy and confidentiality
- Government involvement in research[8]
- Transfer of genetic data and sample across countries
- Medical records storage

These are some of the existing issues you should be aware of, though answers as to how to handle these ethical differences are not always readily apparent. It is important that researchers walk softly when encountering such issues, try not to jump to conclusions, and keep the lines of communication open with their research partners.

7 Cong (2004)

8 Sleeboom (2005)

Closing

In closing, we want to congratulate you for being willing to explore such a rewarding, exciting yet challenging breakthrough platform for translational and clinical research. Hopefully, you now have a much deeper and broader understanding of what is needed for your project to experience success on all levels, as well as realistic expectations for what challenges lay ahead. The JI has worked tirelessly to meet our challenges head on at both the institutional and individual team level. It is our sincere wish that the lessons we have learned and the successes we have experienced will inspire and guide you as you move forward with your own unique initiative. We also hope you will "pay it forward" and pass on the torch of your learning to others who wish to make a similar contribution to solving our global health problems.

It is our sincere wish that the lessons we have learned and the successes we have experienced will inspire and guide you as you move forward with your own unique initiative.

References

Cong, Y. (2004). Doctor-Family-Patient Relationship: The Chinese Paradigm of Informed Consent. *Journal of Medicine and Philosophy, 29(2),* 149-178.

Cummings, J., Finholt, T., Foster, I., & Kesselman, C. (2008). *Beyond Being There: A Blueprint for Advancing the Design, Development and Evaluation of Virtual Organizations. The Final Report from the Workshops on Building Effective Virtual Organizations.* National Science Foundation. Retrieved from http://www.educause.edu/Resources/BeyondBeingThereABlueprintforA/163051.

Falk-Krzesinski, H. J., Hall, K., Stokols, D., & Vogel, A. (2010). *Science of Team Science.* Wikimedia Foundation, Inc. Retrieved from http://en.wikipedia.org/wiki/Science_of_Team_Science.

Lee, C. P., Dourish, P., & Mark, G. (2006). The human infrastructure of cyberinfrastructure. *Computer Supported Collaborative Work*, 483-492. Banff, Alberta, Canada.

Levina, N., & Vaast, E. (2005). The emergence of boundary spanning competence in practice: Implications for implementation and use of information system. *MIS Quarterly,* 29(2), 335-363.

Luo, A., Zheng, K., Bhavnani, S., & Warden, M. W. (2010). Institutional infrastructure to support translational research. *IEEE Sixth International Conference on e-Science 2010,* 49-56.

Sleeboom, M. (2005). The Harvard case of Xu Xiping: Exploitation of the people, scientific advance, or genetic theft? *New Genetics and Society,* 24(1), 57-78.

Wang, X., Wang, E., & Marincola, F. M. (2011). Translational medicine is developing in China: a new venue for collaboration. *Journal of Translational Medicine,* 9(3), 1-4.