



MAYO CLINIC



**Karolinska
Institutet**

EDUCATION, RESEARCH & INNOVATION **PLATFORM**

Evaluation of Karolinska Institutet and Mayo Clinic Collaboration

2016

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Executive Summary

The evaluation shows that the collaboration has been very successful in almost all areas it set out to work within. First and foremost it has succeeded in providing the two institutions with a formal platform for initiating and supporting collaboration in science, administration, innovation, and education and it is a cornerstone for those interested in broader and bigger opportunities than each individual institution can provide as a separate and independent academic system. This formal international collaboration is unique at both institutions as it is the first for both and is a blueprint for others who aspire to generate similar partnerships. The collaboration has a strong steering committee with representatives from both institutions; it provides seed grants for collaborative projects in all four areas of focus; provides support for locating collaborators; it stimulates and encourages collaboration for those interested in external grants; and it provides those who are starting out in research a strong support system with ample opportunities.

The Collaboration between Mayo Clinic and Karolinska Institutet (KI) was initiated in 1992. The first collaboration meeting was held in Stockholm in 1994 and has been an annual event since then, alternating between the two institutions. In 2011 a formal Memorandum of Understanding (MoU) was signed by CEO's of both institutions and since then a total of over 1200 attendees have participated in the conference. 187 (161 unique) individuals have been part of successful grant applications for travel, collaboration or administration.

The areas the collaboration is focused on are research, education, administration, and innovation. The main objectives of the collaboration are: 1) Increase collaboration between the two institutions, 2) Exchange students and academic staff members, 3) Increase interdisciplinary collaboration, 4) Increase quality of scientific output, and 5) Accelerate healthcare progress.

The evaluation used a mixed methods approach of document analysis, bibliometric analysis, personal interviews, and surveys. The results of the evaluation show that the collaboration has been very successful in almost all areas but most notably in increased collaboration both among scientists and among administrators. This success is demonstrated by major increase in number of publications with authors from both institutions and citing of these publications. Additionally the collaboration was able to successfully apply for a grant at The Swedish Foundation for International Cooperation in Research and Higher Education (STINT) of which funding supports the administrative infrastructure of the collaboration at KI.

In addition to many very successful collaborative teams in biomedical research there have additionally been decidedly accomplished collaborative teams in administration, education, and innovation. As is reflected in evaluation interviews and surveys, grant awardees greatly value the opportunity for collaboration and exchange of ideas. Recipients are very satisfied with the award and have used it to exchange ideas, pertinent material, and scientific data as well as conducting pilot studies. Despite the rather limited funding available in the grants, many have successfully published their work, presented it internationally and have been awarded further grants for their collaborative work.

The STINT grant was a two-year award conferred in 2014 and aimed at forming a deep strategic partnership between the two organizations to establish novel structures for international collaboration in healthcare management, information exchange, and innovation. The grant application rested on the notion that “There is a vision that the interaction will lead to strategic partnership with independent funding from external sources.” The grant allowed the KI side of the collaboration to develop, organize, and establish needs for continuing and sustainable funding that will in turn improve and increase scientific and administrative output that will benefit not only this collaboration but others who aspire to establish similar collaborations. As an outcome of the collaboration an international innovation strategy has been developed at KI. This Master collaboration agreement ensures continued collaboration and describes joint processes for legal, financial and innovation aspects of the collaboration. The agreement means that there is now a joint system between KI and Mayo Clinic for intellectual property sharing and protection in collaborative projects. As a standalone agreement, a template for data and material transfer agreement has been established which outlines the principles of free transfer of materials, data and IP. This Master agreement is a major step towards solidifying and strengthening the collaboration between the two distinguished and prominent organizations.

The number of co-publications with authors from both institutions is steadily increasing, up from 21 publications in 2008 to 107 in 2015 which is a much higher rate of increase in co-publication than separate increase at each institution (194% compared to 49% for Mayo Clinic co-publications and 37% for KI co-publications). Citation analysis done with bibliometric analysis methods shows that 40% of these publications are among the worlds’ most highly cited. The average journal impact factor for co-publications is about twice as high as the average impact factor for publications at each separate organization. Analysis was done where unit of analysis was areas of research. The areas supported by the collaboration demonstrates that even though there are a few very prominent areas that receive a great deal of support from the collaboration there are also many that have fewer individuals and smaller footprint and that are distantly related to the more prominent actors of the partnership. This is a positive trend as the science of collaborators has become diverse and provides opportunity for new and stimulating research. Another analysis was done where individuals were unit of analysis and as with the science there are a few very prominent individuals who have many collaborators however there are also many who are remotely connected and have only a few collaborators. All of these analyses presented the growth and increased scientific and individual diversity of the collaboration.

Participants in interviews and surveys expressed great appreciation for the collaboration and all it entails and find the current structure with grants and conference very positive and successful. Many participants in the evaluation voiced the sentiment that their research would not have been possible without the formal collaboration and that the professional connections and research collaboration are invaluable to them and their work. Participants in the annual conference have been very satisfied with organization, topics discussed, opportunity to exchange and explore new ideas, and time to network. A majority of respondents suggested it has helped them establish professional contacts. Exchange of students and post docs have occurred mainly informally rather than through formalized agreements and are therefore difficult to trace.

The two organizations approved a combined use of their logos which is prominently displayed on all communication and correspondence, additionally the collaboration has its own [website](#) which presents history of the collaboration along with all other pertinent information regarding the partnership.

The main areas that need improvement are of internal administrative nature as they pertain to database, communication, and organization of information. This is due to the growth of the collaboration as the cumulative number of awardees and participants are currently in the thousands a condition which demands a strong technical infrastructure. As the collaboration has matured and number of participants and recipients of grants has greatly increased it is the right time to move the management to a level of a large and mature collaboration with a systematic approach.

Introduction

Background

Collaboration between the Mayo Clinic and Karolinska Institutet (KI) began in 1992 as partnership between Dr. K Sreekumaran Nair at Mayo Clinic and Dr. John Wahren at KI within diabetes, metabolism, and nutrition research. During the following years the institutions exchanged scientists as researchers spent extended time at each institution. In 1994 the first annual Mayo Clinic-KI meeting was held in Stockholm focusing on research in the field of diabetes, metabolism, and nutrition. Since then an annual conference has been held alternating between Stockholm and Rochester.

A formal agreement was first signed in 2009, and a post-doctoral training program Implementation Agreement in 2010. A new Memorandum of Understanding was celebrated in 2011 and since then the collaboration has expanded to include many areas of joint scientific, academic, and clinical interests. The main objectives of the collaboration are: 1. Increase collaboration between the two institutions, 2. Exchange of students and academic staff members, 3. Increase interdisciplinary collaboration, 4. Increase quality of scientific output, and 5. Accelerate healthcare progress. The initial four focus areas are education, research, innovation, and leadership. More specifically each area prioritizes the following:

Education

- Post-doctoral Exchange
- Medical Student Rotation
- Annual Scientific Meeting
- Scientist Semi-Sabbatical
- Exchange of visiting faculty
- Multidisciplinary Medical Simulation

Research

- Diabetes and Metabolism
- Regenerative Medicine
- Bioinformatics
- Neurodegenerative Diseases
- Collaborative Projects/ Joint Grant Applications/Benefactor Support
- Formalize a process for Collaborative Scientists and Visiting Scientists

Innovation

- Site visits to exchange ideas on the innovation process
- Idea exchange on key areas of administrative support

Leadership

- Establish a Steering Group
- Identify scientific, education, and administrative leaders

As part of the agreement, both institutions sponsor the collaboration annually with \$160.000 for grants and approximately \$100.000 for the yearly conference and other expenses.

In preparation for the upcoming renewal of the collaboration between the two institutions the Collaboration Steering Committee initiated a program evaluation process of which results will inform the renewal process. The following results present the outcome of that process.

The evaluation was completed by Dr. Terese Stenfors-Hayes, Director of Evaluation Unit at KI and Dr. Katrin Frimannsdottir, Associate Director of Program Evaluation at Mayo Clinic College of Medicine and Science. This report was presented to the Collaboration Steering Committee January 20th, 2017.

Objectives

There are three main objectives of this explorative evaluation:

- Describe the collaboration in detail.
- Determine the outcome of the collaboration on academic productivity.
- Explore impact of the collaboration on grant awardees and their teams.

Methodology

The evaluators used an exploratory approach of a mixed methodology to acquire data for the evaluation process (Table 1). The methods used were document analysis (including grant progress reports), grant analysis, publication analysis, surveys, and personal interviews. Analysis of existing documents provided the base for background and exploration of process of the alliance. Attempts were made to access data regarding student, PhD, and post doc exchange but were unsuccessful in locating available and accessible data.

	Evaluation tools	Data source	Analytical methods	Number of participants
History and process of collaboration	<ul style="list-style-type: none"> Document analysis 	<ul style="list-style-type: none"> Document folders at KI and Mayo Clinic 	<ul style="list-style-type: none"> Qualitative content analysis 	<ul style="list-style-type: none"> NA
Continuous funding	<ul style="list-style-type: none"> Grant analysis 	<ul style="list-style-type: none"> MIRIS 	<ul style="list-style-type: none"> Quantitative output and outcome analysis 	<ul style="list-style-type: none"> All Mayo Clinic grant recipients n=61
Academic productivity	<ul style="list-style-type: none"> Bibliometric analysis Grant progress reports Survey 	<ul style="list-style-type: none"> Web of Science, Medline Annual progress reports Survey results 	<ul style="list-style-type: none"> Quantitative output and outcome analysis 	<ul style="list-style-type: none"> All authors All grant recipients (n=187), Survey respondents (n=60)
Participant perceptions of success and satisfaction	<ul style="list-style-type: none"> Grant progress reports Surveys Personal interviews 	<ul style="list-style-type: none"> Grant progress reports Survey results Conference survey results Analysis of personal interviews 	<ul style="list-style-type: none"> Quantitative and qualitative analysis 	<ul style="list-style-type: none"> All grant recipients (n=187) Survey respondents (n=60, n=175) Interviews (n=16)

Table 1 Overview of methodology

Detailed Findings

Leadership

The collaboration is led by a steering committee consisting of Dr. Martin Schalling, Dr. Jan Andersson, Dr. Anders Gustafsson, Dr. Lillian Wikström, Dr. Ulrika Widegren from KI and Dr. Eric Wieben, Dr. Jim Maher, Dr. Sree Nair, Josh Derr, Julie Henry from Mayo Clinic, with administrative support from Pernilla Witte (KI) and Jaci Gosse (Mayo Clinic). In 2012, a joint competitive annual travel award program was initiated to promote short-term travel between institutions by faculty, staff, postdoctoral fellows and students to plan or conduct collaborative interactions. The following year, competitive project grants were added as mechanism to build collaborative strength toward national and international project funding. In 2015, the awards program expanded to include funds for administrative projects. An annual conference has been organized each year alternating between the two institutions.

Collaborative model

A logic model is a tool that describes in a visual format the intended change of a program or a process. The evaluators studied the collaboration in detail and subsequently drafted a logic model which was distributed to leaders of the collaboration who made minor changes of recommendations. The logic model for the KI/Mayo Clinic collaboration is presented in Figure 1 (a larger version is included in Appendix A), it is divided into five main categories; input, activities, output, outcome, and impact. As is stated in the MoU, the intended impact is „to establish a long-term, substantive, and complementary cooperative relationship encompassing educational, research, and entrepreneurial activities.“ In addition to the MoU several documents informed the preparation of the logic model, among them the Collaboration Plans, Implementation agreement, and presentation document on “Future Collaboration.”

Karolinska Institutet – Mayo Clinic - Collaboration
Logic Model

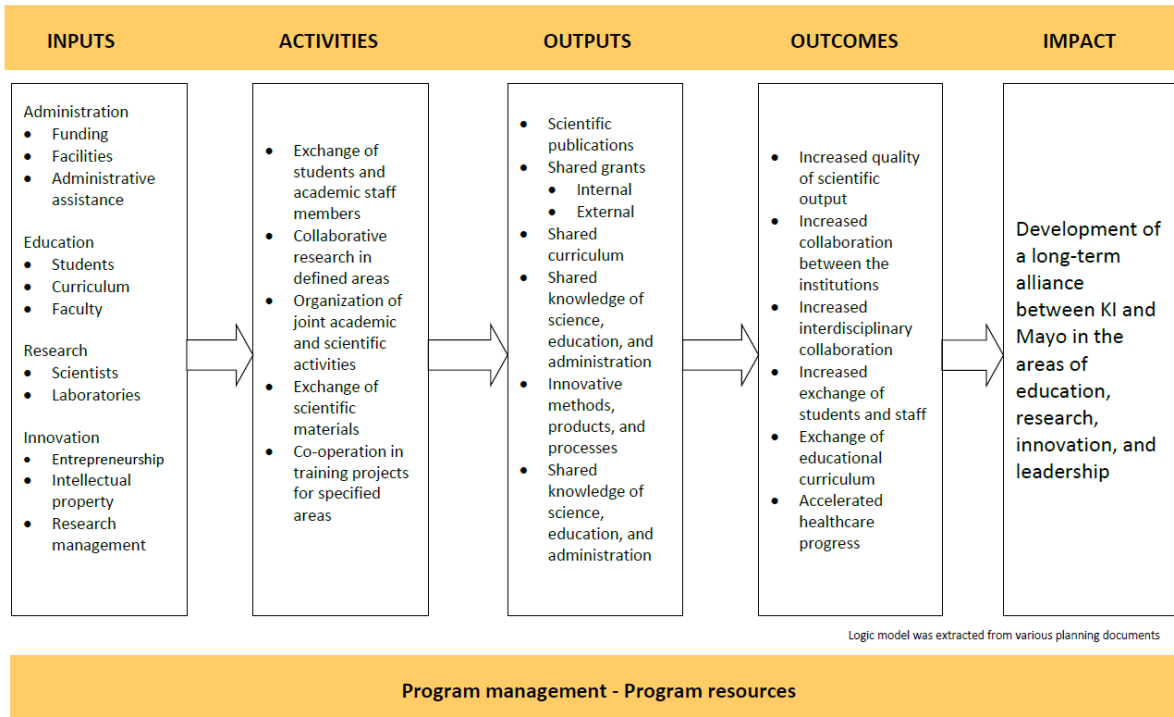


Figure 1 Logic model of collaboration

The main four focus areas of the collaboration are developed with inputs from both institutions which include administration, education, research, and innovation. The activities and the mechanism in which the collaboration is using to attain defined outcome are grant awards; exchange of students, scientists, and faculty; collaboration in areas of research, education, innovation, and administration; exchange of scientific material; organization of joint academic and scientific conference; and cooperation in training projects for specified areas. The outputs that are expected to be produced by participants are publications, continued grant funding, and shared curriculum and knowledge within science, education, and administration. The outcome from the output is expected to be increased and improved scientific output, increased collaboration between the institutions, increased interdisciplinary collaboration, education, exchange of educational curriculum, and ultimately improved healthcare. These steps are expected to lead to the desired impact of long-term alliance in the four focus areas.

Academic productivity

The outputs of the collaboration are, as described in the logic model, scientific publications, grants awarded, shared curriculum, and innovative processes and products. The evaluation focused on academic productivity and the impact of the collaboration on the grant awardees and their teams.

Publication analysis

A count of annual co-publications was done with the help of KI bibliometric team. Included are all publications that have authors from both institutions. This means that all publications, regardless whether authors were directly supported by the collaboration or not were included.

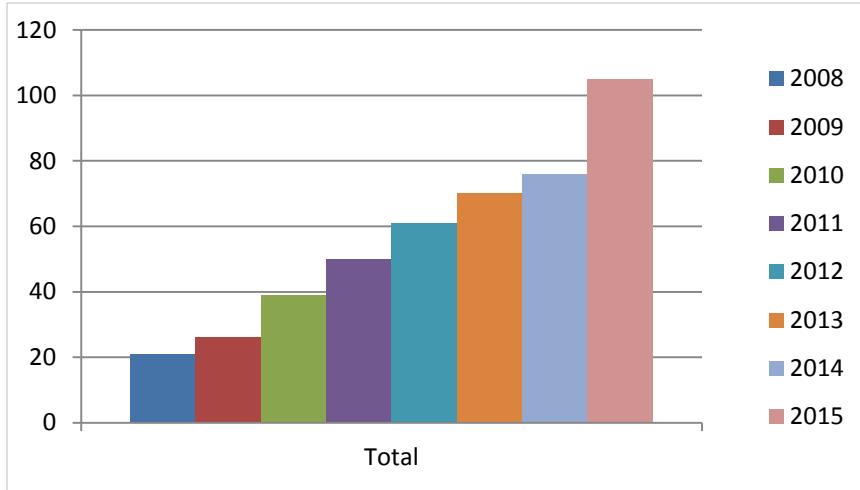


Figure 2 Count of annual co-publications. Certain data included herein are derived from the Web of Science[®] prepared by THOMSON REUTERS[®], Inc. (Thomson[®]), Philadelphia, Pennsylvania, USA: © Copyright THOMSON REUTERS[®] 2017. All rights reserved.

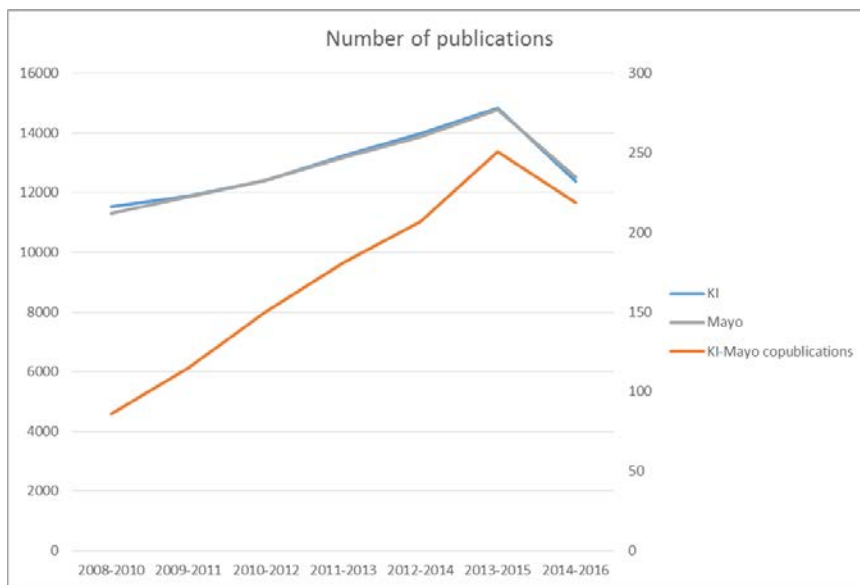


Figure 3 Number of publications. Certain data included herein are derived from the Web of Science[®] prepared by THOMSON REUTERS[®], Inc. (Thomson[®]), Philadelphia, Pennsylvania, USA: © Copyright THOMSON REUTERS[®] 2017. All rights reserved.

Co-publications between KI and Mayo Clinic are increasing in number more rapidly than the average increase of publications in the two individual organizations with the total increase 2008-2010 to 2013-2015 being 194% compared to approximately 30% for all publications at KI and Mayo Clinic. This larger increase in co-publication is however partly due to both organizations participating in the same multicenter studies (as defined by articles with authors from more than five countries), rather than the KI Mayo Clinic collaboration per se.

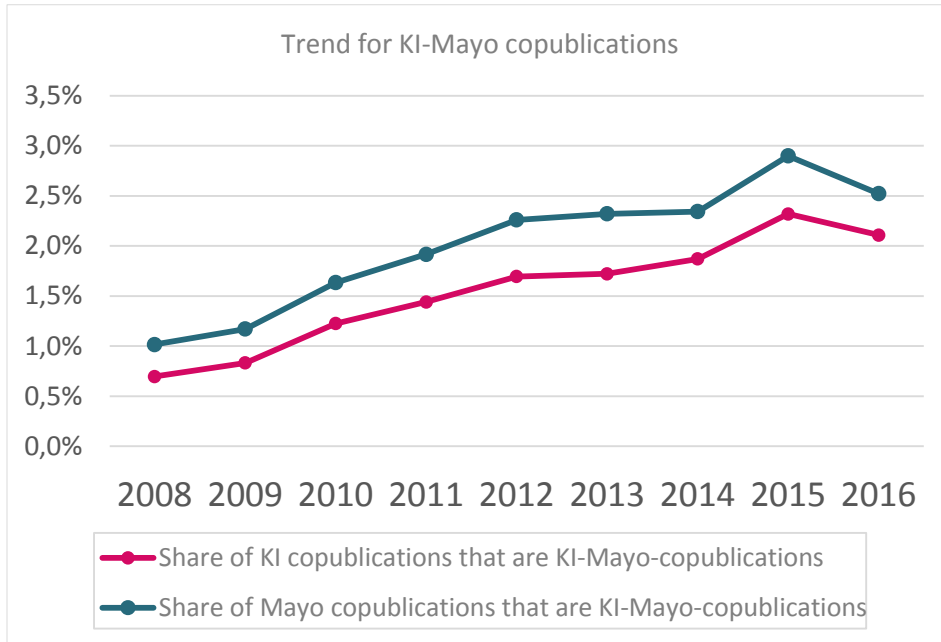


Figure 4 Number of co-publications. Certain data included herein are derived from the Web of Science[®] prepared by THOMSON REUTERS[®], Inc. (Thomson[®]), Philadelphia, Pennsylvania, USA: © Copyright THOMSON REUTERS[®] 2017. All rights reserved.

However, co-publications between KI and Mayo Clinic are also increasing in number more rapidly than the average increase of co-publications in the two individual organizations (Figure 4, Table 2) as publication increase for all Mayo Clinic and KI authors in the time period is 49% at Mayo Clinic and 37% at KI. The period 2014-2016 was not complete at the time of analysis.

Increase Mayo-KI co-publications	194%
Increase all Mayo Clinic co-publications	49%
Increase all KI co-publications	37%

Table 2 Trend for KI-Mayo Clinic co-publications Certain data included herein are derived from the Web of Science[®] prepared by THOMSON REUTERS[®], Inc. (Thomson[®]), Philadelphia, Pennsylvania, USA: © Copyright THOMSON REUTERS[®] 2017. All rights reserved.

When analyzing the number of citations, the average number (field normalized) to KI-Mayo Clinic co-publications is much higher than citations to publications from the individual organizations, they are for the later time periods cited almost 8 times the world average (Figure 4).

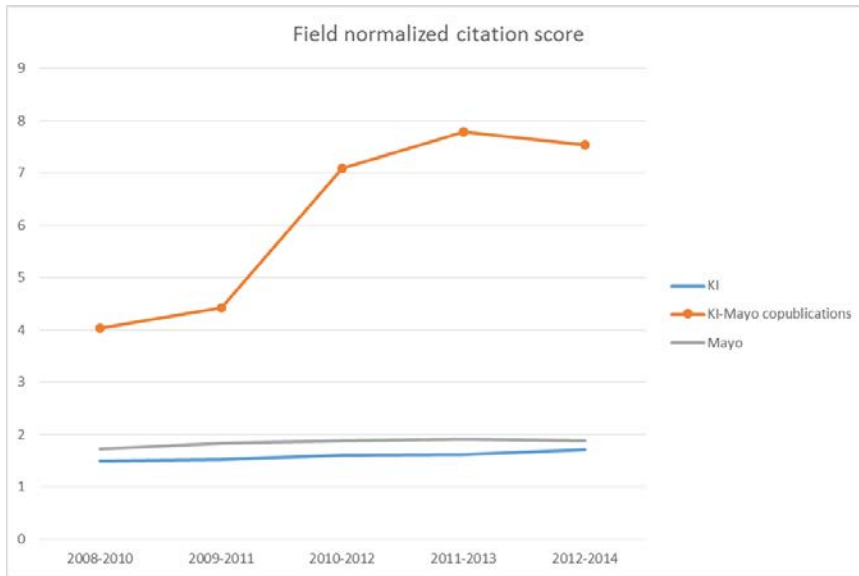


Figure 5 Field normalized citation score. Certain data included herein are derived from the Web of Science[®] prepared by THOMSON REUTERS[®], Inc. (Thomson[®]), Philadelphia, Pennsylvania, USA: © Copyright THOMSON REUTERS[®] 2017. All rights reserved.

The share of highly cited publications (field normalized, 5%) is much higher for KI-Mayo Clinic co-publications than for publications from the individual organizations. Over 40% of the publications are among the world’s most highly cited (Figure 5).

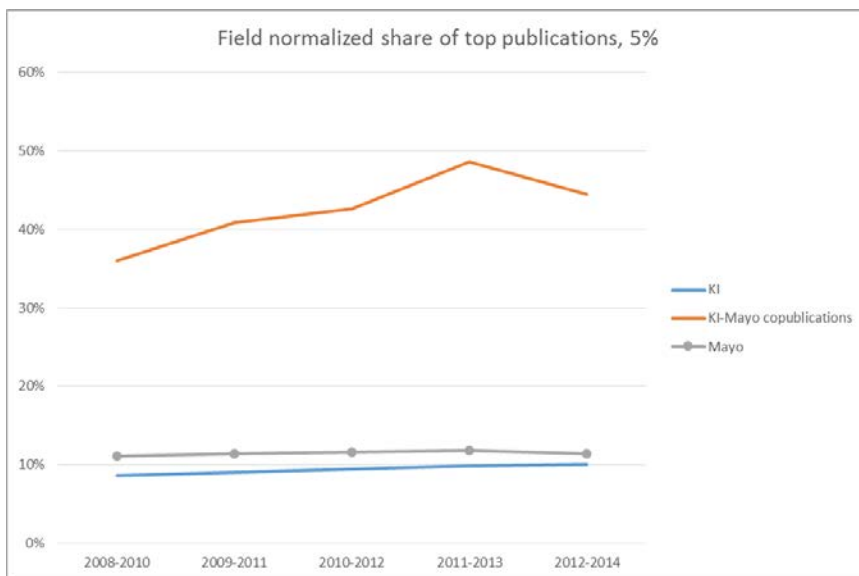


Figure 6 Field normalized share of top publications Certain data included herein are derived from the Web of Science[®] prepared by THOMSON REUTERS[®], Inc. (Thomson[®]), Philadelphia, Pennsylvania, USA: © Copyright THOMSON REUTERS[®] 2017. All rights reserved.

The average journal impact factor for KI-Mayo Clinic co-publications is more than twice as high as the average impact factor for publications from the respective organizations (Figure 6).

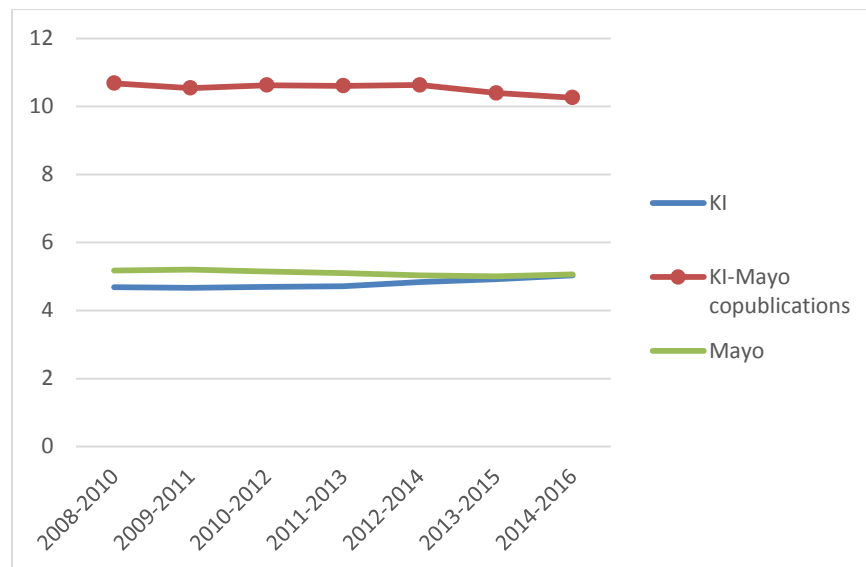


Figure 7 Average journal impact factor Certain data included herein are derived from the Web of Science[®] prepared by THOMSON REUTERS[®], Inc. (Thomson[®]), Philadelphia, Pennsylvania, USA: © Copyright THOMSON REUTERS[®] 2017. All rights reserved.

It should be noted that the field normalized citation score and the field normalized share of top publications are generally higher for multicenter studies, and that the large share of multicenter studies in KI-Mayo Clinic co-publications (75 %) therefore probably affects both these indicators. Many KI-Mayo Clinic co-publications (and also multicenter studies in general) are in areas with high impact factor journals (such as cell biology or genetics) and this may affect the average JIF.

Further analysis was done with the help of KI bibliometric team on publications by authors from both Karolinska and Mayo Clinic between January 1st 2013 and June 30th of 2016. Appendix B presents these co-publications by area. The main clusters that publications originate from are within genetic research such as Genetic predisposition to disease, Breast Neoplasms, and Polymorphism, Single Nucleotide. What is also clear from the analysis is that the main clusters are not the only fields being published but there are a great number of diverse research areas where the co-authorship articles represent fields such as obesity, IBS, stroke, sports, cost of illness, and celiac disease.

Appendix C presents the bibliometric analysis on co-publications with authors as unit of analysis. The green color represents authors from Mayo Clinic, the maroon color authors at KI, and the orange color represent double affiliations. There are a few very active individuals from both institutions such as Dr. Fergus Couch and Dr. Janet Olson at Mayo Clinic and Dr. Per Hall and Dr. Kamila Czene at KI however there are also quite a few researchers who are loosely connected to the main active individuals and the area they represent such as Dr. Michael Ackerman and Dr. Joanna Biernacka at Mayo Clinic and Dr. Paul Lichtenstein and Dr. Catharina Lavebratt at KI.

Conference presentations

Survey and report data show that findings have been presented in various international fora such as:

- * New Technologies, New Vaccines
- * American Association for Cancer Research
- * International Ultrasonic Conference
- * Society for Neuroscience and Biological Psychiatry
- * National Network of Depression Centers
- * World Conference of Psychiatry
- * American Academy of Child and Adolescent Psychiatry
- * World Psychiatric Association meeting

Grant analysis

A total of 187 individuals (161 unique, 26 repeat) have been associated with the grants awarded 2013-2015. As part of the collaboration, a shared platform for the administration of the grants and the review process has been established through collaboration between the two grants offices and the steering committee. Table 2 presents an overview of awardees of the collaborative grants.

		Travel grant	Project grant	Administrative grant	Individuals on grants
2013	Applications	40	30		
	Awards	20	11		45
2014	Applications	15	38		
	Awards	7	14		56
2015	Applications	9	39	3	
	Awards	8	11	3	86

Table 3 Overview of grant recipients

To learn more about the collaborations a survey was sent out to all grant recipients in 2013-2015. The answers on the survey were rated on a four point scale with strongly disagree =1, disagree =2, agree =3, and strongly agree =4. Personal interviews were completed with a total of 15 individuals from both institutions. In this report the verbatim quotes from comments and interviews are italicized. Furthermore, all final reports from all awardees were explored.

Travel and administration grants

A survey was distributed to all recipients of the travel and administration grants, during the years 2013-2015. The response rate was 30%. Respondents of the survey said that the collaboration in most cases started after meeting each other at a KI/Mayo Clinic conference (21%) or after they were introduced by a colleague (21%). In some cases they met at a conference not related to the KI/Mayo Clinic collaboration (16%) or started when the respondent read an interesting article by the collaborator and got in touch (10%). A few joined an already established collaboration (5%) or received the travel grant and found a collaborator during their trip (5%). In several cases (21%) the collaboration started in other ways, for example initiating a contact by themselves.

Outcomes and opportunities

Respondents strongly agreed that the award met their expectations and that the award had opened up opportunities that would not have been possible without it. They agreed that the award had produced ideas for the future, but disagreed somewhat with the statement that the award has made a difference in their career plans.

All respondents (100%) reported that they were able to develop relationships at the hosting institution, some commented that they also established relationships within their own institution that they would not have otherwise. For some, KI and Mayo Clinic became an introduction to US and Europe and the differences and similarities that may or may not exist. Many described that the collaboration had

continued after the grant period had ended. These collaborations sometimes took the form of more unstructured interactions, such as discussions and sharing of information and knowledge. In other cases the collaboration produced articles, sharing of technology and co-supervision of a PhD student and led to collaborative project grants.

We now have an excellent working relationship with our colleagues at KI who continue to work in the same area of research as our group at Mayo. We are able to bounce ideas off them and we continue to explore different approaches to problems each institution has whether it's samples preparation or instrumentation, etc.

Strong contacts on both the technology side of biobanking, as well as developing collaborations on the collections side.

Being able to work directly in the laboratory with our colleagues at KI enabled us all to better understand the limitations of each institution when trying to answer our hypothesis. Fortunately we agreed on a model system that allowed us to move forward to demonstrate the benefits of the methodology that is now in use at both institutions.

We identified common interests, designed some joint support materials and uncovered some unexpected opportunities which became the basis for a new successful application. In addition we gained some considerable benchmarking insights and learning from our counterparts.

This was a very productive collaboration that exceeded my expectations for its impact. It was also very rewarding personally to meet several new stimulating colleagues.

Great way to get to know more about a US research institutions' similarities and differences both.

In most cases, the respondents experienced that the collaboration did not initiate major changes in their clinical practice, teaching, research or administrative work. However some mentioned that their new and broader network influenced how they work today, that they have implemented the methods developed through their research in their work and that their approach on education and leadership had changed. Awardees of administrative grants also emphasize how they have tried and implemented systems at their home university that they learned about through their collaboration, such as working with grant facilitators which is common practice at Mayo Clinic but somewhat unusual in Sweden, or learning about how to structure a comprehensive case management system. The collaboration between the KI Grants office and the Mayo Clinic Office of Sponsored Projects Administration also received some attention in the NCURA Magazine, (published by the National Council of University Research Administrators) for their successful work developing a platform for to facilitate research proposals to external funding agencies and cultivate management strategies to support awarded projects.

Yes, gave a better understanding in differences and similarities and our internal processes - and the legal framework we work within - so has helped to improve our work processes.

It's a great idea to form these relationships because they also benefit you in your career within your own institution by getting to know and work with others that you normally wouldn't have an opportunity/reason to work with.

Synchronized clinical testprocedures.

We have constructed a relationship that makes us a hub for moving grant applications forward and are better able to work within the constraints of both our partner offices and funding requirements. This includes an increased capacity to work with other offices within our own institutions

The grant project clarifies some of our own interactions and work processes. This was serendipitous and helpful.

Yes, it helped us clarify our own ways of working with biobank contracts.

Grant administration

The respondents agreed that the administrative aspects of the grant worked well and was not burdensome.

	Mean	Average answer
The reporting requirements for the award were burdensome.	1.6	Disagree
The application process for the award was burdensome.	1.9	Disagree
The award covers too short of a time to meet my needs.	2.4	Disagree

Table 4 Travel and admin grants, administration

Project grant

Despite numerous reminders, the response rate for the survey ended at 40% for the project grant awardees. When asked how the collaboration started, responses show that the collaboration in most cases started after meeting each other at a KI/Mayo Clinic conference (36%), a conference not related to the KI/Mayo Clinic collaboration (32%) or that they were introduced by a colleague (26%). In less common cases the collaboration started because the respondent read an interesting article by the collaborator and got in touch. None of the collaborations were initiated based on the contact information on the KI/Mayo Clinic website where researchers can request new partners. This function was added to the conference in 2014 and many respondents had already established their collaboration at that time.

Outcomes and opportunities

The researchers describe that the grant made it possible to kick start the collaboration and collect data. The grant facilitated the process, made logistics easier and paid for travel).

This collaborative project would not have been possible without the MC-KI collaborative grant program. This collaboration was utilizing unique expertise and strength of each department.

Logistics around student travel were facilitated. Meeting of the PIs was facilitated by travel for the MC/KI symposia. We could have done everything else as a matter of \$\$, but the facilitation of logistics was very important.

This seed funding has been incredibly valuable for getting the project up and running, generating preliminary data, recruiting students and preparing grant applications.

	Mean	Average answer
The collaboration was/has been successful.	3.7	Strongly agree
The collaboration met my expectations.	3.5	Strongly agree
The award opened up opportunities for me that I would not have had without it.	3.5	Strongly agree
The collaboration would not have been possible without the award.	3.3	Agree
The award is/was very important to my PhD/MSc students and/or postdoc trainees.	3.0	Agree

Table 5 Project grant, outcomes and opportunities

The grant gave unique opportunities to exchange expertise and material and gave access to equipment that was only available at KI or Mayo Clinic. Hence, the grant afforded research to be carried out that would not have been possible at a single site.

We started a project in a new area of mutual interest. We exchanged visits and generated new interesting data. During the visit from Mayo the guest scientists, post docs and students in the group had excellent possibilities to learn new aspects of their projects, so in many ways this would not have been possible without the Mayo-KI grant.

We were able to host a PhD student from KI & provide anonymized access to clinical specimens on Mayo's campus to further the project without patient confidentiality concerns.

It provided access to model systems available only at Mayo.

We wouldn't have done these experiments to test feasibility of our proposed studies.

We could explore clinical applications on our Pre-clinical work. This will now lead to new treatments in the clinic.

Sustainability

Most respondents described that the collaboration has continued after the grant period ended. In some cases the collaboration also resulted in obtaining a joint PhD-student and visiting post doc researchers.

	Mean	Average answer
The collaboration has produced future research ideas.	3.7	Strongly agree
The award has made a difference for my career plans.	2.5	Agree

Table 6 Project grant, sustainability

The experiments did not work out as planned so there is no use to continue along these lines. However, there might in the future be other aspects that can be explored in collaboration as we have such complementary expertise/experimental model systems.

We now have long term collaboration, which is fantastic.

We have expanded our efforts on using each other's technology, expertise and biobank material for additional projects.

Opportunities for collecting data from patient cohorts in the US and Sweden.

Wow, a lot! We are doing PDX trials, we will explore combinations and we plan to set up new clinical trials at Mayo, which will be first time in US.

As most respondents are senior researchers with their own labs, it is not surprising that the grant may not affect their career plans to a larger extent, albeit the direction of their research.

Grant administration

The respondents experienced that the administrative aspects of the grant worked with ease. Some felt the project time was too short and the award sum too limited (Figure 7).

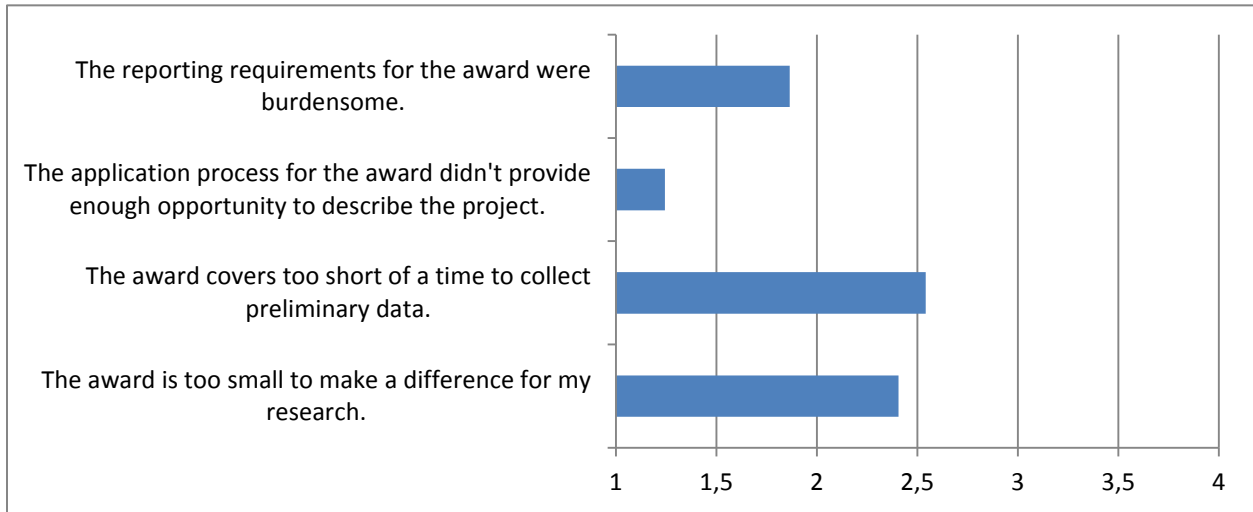


Figure 8 Project grant, administration

The thoughts on which were the greatest challenges in the grant collaboration varied. Several believed that it was the distance between KI and Mayo Clinic, others that there were problems in finding time to meet when such busy researchers were involved, and the staff in some cases were too busy with clinical work. Others meant that it was the small scope and funding, making it difficult to have time to do more than meet and plan within the scope of the grant.

From a general point of view these grants are not very large and enough to support extensive independent projects, but as initiators they are great, so I actually believe that the outcome of the invested money is much higher if the program supports several smaller projects rather than a few big ones.

It would be easier without distance, but it has worked out great and face2face meeting on Mayo-KI conference.

Communication between two busy PIs, and project costs that far exceeded the amount supported by the MC/KI funding source.

Limited time to devote to the project given limited funding versus other commitments

Grant is too short in duration to execute meaningful projects

The importance of good communication in terms of aims and project plan and some early face to face meetings was emphasized by many.

Make sure to meet your KI collaborator in person as early as possible. If possible, meet with him/her in person before the collaboration starts. Immediately after we received the award, our collaborator from KI visited Rochester. We brainstormed for a couple of days. This was very beneficial. It allowed us to carefully plan our collaborative research and maximize the use of funds.

External funding

Based on the survey data the following grant agents have been identified by the recipients and have been applied for:

American Foundation for Suicide Prevention	Swedish research council
International Myeloma Foundation	Swedish Heart and Lung foundation
NIH RO1	Johnson and Johnson
NIH R21	STINT (Swedish foundation for international collaboration in research and higher education)
NIH K22	Precision medicine Initiative (European biobanking)
NFL-GE Head Health	Marianne and Marcus Wallenberg's foundation (Sweden)
National council of university research administrators (NCURA)	ALF (Sweden)
Minnesota ovarian cancer research grant	ALF-PPG (Sweden)
Lymphoma SPORE (specialist program of research excellence)	Demensfonden (Sweden)
American Cancer Society	Gun and Bertil Stohne's foundation (Sweden)
The international Waldenströms Macroglobulinemia Foundation (IWMF)	Stiftelsen för gamla tjänarinnor (Sweden)
Mayo Clinic Florida seminar series fund	Märta Lundqvist foundation (Sweden)
NIMH (national institute of mental health)	KID (KI doctoral student funding)
The National Institute of Allergy and Infectious Diseases (NIAID)	Stiftelsen Söderström Königska sjukhemmet (Sweden)
Human Immunology Project Consortium (HIPC) Infrastructure and Opportunities Fund (IOF)	

Table 7 Grant agents applied for

One of the main outcomes of the collaboration is to provide seed money for a research collaboration where awardees can gather preliminary data which could enable awardees to apply for a bigger follow up grant. We made an attempt to analyze grant application and awards by awardees however KI does not have a comprehensive grant application and award database and this prevented any analysis to be performed, as a manual search was not possible within the scope of this evaluation. Mayo Clinic has such a database (Mayo Integrated Research Information System, MIRIS) and a search was performed on all those who have received a KI/Mayo Clinic award in the past (Table 8). We searched for 61 awardees, 37 (61%) applied for grants, and of those 25 (68%) received a total of \$35,914,488 in the years 2013-2014 in external funding. This is equivalent of 35% of the 61 KI/Mayo Clinic awardees. Since MIRIS only

includes Mayo Clinic employees this represents Mayo Clinic awardees only. No comparative analysis was done on a control group since this was incomplete data from one side. These results are thus for description purposes only.

Unique awardees	Applied for grants	Received grants	\$ awarded
61	37 (61%)	25 (68% of applicants)	\$35,914,488

Table 8 Follow-up grant analysis Mayo Clinic

Annual conference

Since 2013, when the collaboration was expanded to education and administration, the conference has been open to all those interested in the collaboration. A total of almost 1200 attendees have participated in lectures, poster presentations, tours of facilities, and social events. Table 9 presents an overview of attendees at conference since 2013. In 2014 the 20 year collaboration anniversary between KI and Mayo Clinic was celebrated which likely increased the number of participants, in 2015 the number of researchers from Mayo Clinic attending in Stockholm had doubled from the previous conference and for the first time The Karolinska Hospital formally participated in the conference and supported in financially. In 2016 attendance declined considerably, from both KI and Mayo Clinic.

	2013	2014	2015	2016
Attendees	300	330	350	206
Mayo Clinic attendees in Stockholm	60		110	
KI attendees in Rochester		59		43

Table 9 Annual conference attendance

Each year the conference has plenary sessions, break-out sessions, poster sessions and various tracks (Table 10), the chairs of each track often also arrange a social evening event for the participants, which has helped build a collaborative atmosphere within the track. The number of tracks has varied from 14 in 2015 to 6 in 2016.

2013	2014	2015	2016
Autoimmune disorders	Autoimmune disorders	Autoimmune disorders	Autoimmune disorders
Cancer	Cancer	Cancer	Cancer
Diabetes and Metabolism	Diabetes and Metabolism	Diabetes and Metabolism	Diabetes and Metabolism
Education	Education	Education	Education
Psychology and Psychiatry	Psychology and Psychiatry	Psychology and Psychiatry	Psychology and Psychiatry
Regenerative Medicine	Regenerative Medicine	Regenerative Medicine	Regenerative Medicine
Science of Healthcare Delivery	Science of Healthcare Delivery	Science of Healthcare Delivery	Science of Healthcare Delivery (posters only)
Administration	Administration	Administration	
Infectious diseases	Infectious diseases	Infectious diseases	
Innovation	Innovation (posters only)	Innovation	Innovation (poster only)
Neurodegenerative disease	Neurodegeneration (posters only)	Neurodegeneration	
	Cardiovascular diseases	Cardiovascular diseases	
		Cardio-Oncology	
		Pharmacogenomics/ Individualized Medicine	

Table 10 Annual conference, overview of tracks offered

The participants at the yearly conference have had the opportunity to take a paper survey where they could express their opinions and experiences from this event. An analysis was done based on the answers from these surveys which have a mix of Likert-scale and open-ended questions. The questions asked have to some extent varied from year to year, making a longitudinal comparison difficult. The number of respondents has been fluctuating over the years, from 48 (2013), to 21 (2014) and 106 (2015). Unfortunately in 2016, only six people responded to the survey; therefore, these data are not included here. This means that the response rate for the survey is limited to 16%, 6%, 30% and for 2016 3%, hence, data presented below should be interpreted with caution as it is likely that the sample is not representative of all conference participants. In 2013 and 2015 the survey was also possible to fill in online, which may explain the better response rate those years. In addition to the survey data, four conference chairs were interviewed.

Over all, the satisfaction each year with the conference as a whole is very high. Participants commented that it was an excellent experience. More specifically, they remarked the conference to be valuable, useful and enjoyable and that the administrative support and organization of the conference was very good. They experienced it as both interesting and developing, at the same time comprehensive and stimulating and included recent research. Respondents suggested that the conference filled an important purpose of initiating collaboration between researchers at both institutions and giving opportunity to learn about each other. Participants felt the event was an excellent mix of business and social events and that it provided interesting exposure to the different cultures of the institutions. KI participants mentioned the conference developing into an appreciated part of the annual scientific cycle of KI.

The meeting was well organized. The initiative is very valuable and will promote interactions between research groups with complementary competences.

Participants experienced a wide range of benefits from the conference. Some felt both a renewed enthusiasm for their work (71%, 2014; 50%, 2015) and that they had ideas on how to improve the way they work in the future (67%, 2014; 55%, 2015). They commented they had learned new things about current research after the lectures and talking to experts in the field. When asked if the conference had helped the participant to establish new professional contacts 73% (2013), 57% (2014) and 62% (2015) answered that it had. 73% (2013) believe that these new contacts would lead to new collaborations. In addition, the participants experienced that already existing relationships were developing further at the conference. Some participants thought of the networking opportunities as the most enjoyable and helpful part of the conference. The conference gave opportunities to participants to discuss research with others, in the same area as themselves as well as others. After the conference the participants planned to stay in touch with the contacts they had made as the conference had given them opportunity to work together. The face-to-face interaction was experienced as an important part in making this possible.

Meeting with my counterparts at KI was very important to me and gave me great ideas on how to move forward.

The participants were asked to provide suggestions for how the conference could be further improved: Some commented that they are really satisfied and that nothing should be changed, and some emphasized that the requests they had were minor. The participants asked for more opportunities to interact with others. For example, they suggest even more interactive sessions, more discussion and for all presentations to give more time for questions. Some felt it may be advantageous to set the deadlines for abstracts and presentations earlier in the spring to avoid planning being made in the last minute over the summer when most Swedish participants are on vacation. The track chairs that were interviewed found the time for the conference problematic as it collides with the start of the academic year for teachers and with a big European cardiovascular meeting. This has had the effect that the cardiovascular track was cancelled in 2016 as not enough speakers could be recruited, another track was also struggling to recruit speakers this year, but that was due to late planning. Discussions with representatives from undergraduate programs at KI confirms that the timing of the conference makes it very difficult to attend, and clinicians have similarly suggested that as they are scheduled six months in advance, the call for abstracts should be announced earlier. Interviewees suggested that it may be an option to explore if a biennial conference is an option, perhaps in combination with smaller meetings for the different tracks. They suggested that a more focused meeting for a certain research area may be easier to recruit participants for, and that a mix of these smaller meetings with a biennial larger conference may be a model to consider. Other interviewees however suggested that the core value of the conference is the larger context, as the researchers within their track also meet at other occasions throughout the year at various international conferences or research visits. The chairs appreciate the freedom given in terms of how to recruit speakers and schedule their track and are mindful of the importance of time for informal discussions and visits to labs or similar. However, some described lack of clarity in terms of

responsibilities and structure between KI and Mayo Clinic chairs as the processes for recruiting speakers are different at the two institutions.

Three tracks at the conference are somewhat different than the others: innovation, administration and education. Innovation has been included in the meeting in different ways: In 2013 as a track with research presentations, in 2014 as “embedded” presentations in plenary, cancer and psychiatry and as a breakfast meeting, in 2015 as a track with a mixture of research presentations and presentation of existing strategies and available support for researchers. In 2016 innovation was part of the poster session. The administrative track has included presentations on the use of bio banks in the collaboration, research space allocation, indirect rates, quality management systems, and fundraising. Some difficulties have been experienced by the chairs in recruiting speakers and participants and it is believed that one reason for this is that the word administration has a different connotation at the two institutions. To rename the track to ‘management’ may be a way to better describe the content of the track. As a service for scientists, meetings with grants facilitators to discuss available funding and ideas have been offered at each conference. Interviewees suggest that this service may be more beneficial to conference participants than presentations, and emphasizes that the collaboration between the administrative units involved is so well established that a track at the conference is not needed for them to further their own learning from each other. In the education track it has been unclear whether this is a research track or a track for innovation and sharing of ideas in education and if the track is focusing on undergraduate education or also graduate, post graduate and continuous professional development training. There has also been lack of clarity as to whether the track should be chaired by a dean or by a selected individual within each institution, which may have somewhat delayed the development and planning of the track.

Other Findings

One of the components of the collaboration was exchange of post-doctoral and medical students. According to the available data from the Faculty Office and International Relations at KI, there has been no formal agreement of student exchange between KI and Mayo Clinic since 2004 and no KI student has taken any course. However, students visiting as part of their master thesis project will not show within the formal exchange programs and hence data is unreliable. Project reports and interview data suggest that several medical and graduate students have visited Mayo Clinic as part of their master thesis project. Additionally, between 2013 and 2015 nine graduate students from Mayo Clinic Graduate School of Biomedical Sciences (MCGSBS) travelled to KI on the grant and five of them visited twice. Survey data show that 76% of researchers agree to the statement that the grant awards have been important to their PhD/MS and/or post doc trainees.

From interviews and document analysis it is clear that doctoral students have been participants in many of the projects that have been funded. PhD student exchange visits of 3-12 months were suggested as one of the early visions of the collaboration, and also co-tutorship. These processes may not have been formalized, but examples exist of PhD students so involved in the collaboration that they have supervisors both at KI and Mayo Clinic, and as mentioned earlier, many PhD students have spent time at the other institution, once or more.

We have secured funding to support a joint PhD student to work at both institutions. This student will help to build the collaboration and partnership and will partake in research training at both institutions.

A combined course is offered in Regenerative medicine for PhD students from both institutions. This is a synchronous course administered by MCGSBS with course directors and lecturers from both organizations as well as other parts of the world. It is offered during spring semester and registrations have been higher than expected (Table 11) for such a specialized course.

	KI	MCGSBS
2015	10	10
2016	11	6

Table 11 Registrations in Regenerative medicine course

In 2014 and 2015 seventeen PhD students from MCGSBS registered in a synchronous online writing course at KI titled “Writing science for information literacy online.” This was an offer initiated by Dr. Anders Gustafsson at KI and Dr. Jim Maher at Mayo Clinic but has not been continued.

In 2010 a five year agreement of post-doctoral exchange was signed between KI and Mayo Clinic. Two announcements seem to have been made by KI (in 2010 and 2015), when funding for this was allocated by the board of research. However, the positions announced were never fulfilled, and post-doctoral exchange, as described in the agreement has not been a priority by the current steering committee. No data has been available regarding whether any postdoc positions were announced at Mayo Clinic. It is

clear however from the project reports that many post-doctoral researchers have been active in the collaboration through the grants program and conference.

Another core area of the collaboration is innovation. Early collaboration plans suggests that site visits should take place so ideas on the innovation process can be exchanged and the two institutions learn from each other. This exchange has taken place, both within the yearly conference but also at other times.

As an outcome of the collaboration with Mayo Clinic, an international innovation strategy has been developed at KI. In September 2016 a Master collaboration agreement was signed which ensures continued collaboration and describes joint processes for legal, financial and innovation aspects of the collaboration. This Master agreement means that there is now a joint system between KI and Mayo Clinic for intellectual property sharing and protection in collaborative projects. As a standalone agreement, a template for data and material transfer agreement has been established which outlines the principles of free transfer of materials, data and IP. The process of developing these strategies have involved intensive collaboration between innovation, administration and legal teams at both institutions. This agreement ensures continued collaboration and details joint processes for a more seamless flow between the institutions.

Whether the collaboration has led to innovations in itself was explored through interviews and survey: Interviewees suggested that patents have been applied for, and many mentioned that either they were just beginning to work on the innovation as a product of the collaboration or that there was great potential for innovation from their project but they had not gotten to the point where that could be focused on. It is not unlikely that with time innovation projects will come to fruition. The survey shows similar signs and nine respondents marked that they think that their project is innovative and a few indicated they may apply for patents in the future or consider collaboration with industry.

Through the grants available, collaboration has also been established between the biobanks at KI and Mayo Clinic respectively. This collaboration facilitated the development of a material transfer agreement and data transfer agreement, now parts of the Master Agreement as described above. It also helped improve the internal work processes at both biobanks and the contact between the two is ongoing, with development of further agreements and established contacts as partly described on the KI Mayo Clinic website.

As described in the logic model, increased interdisciplinary collaboration was one of the suggested outcomes of the collaboration. Interview data and awarded grants show that successful examples of interdisciplinary research exist and that these have helped the field forward. A spontaneous meeting at the lunch table at the conference between a clinician and a lab based researcher which led to successful research collaboration was by one interviewee described like this:

We starting talking he is seeing patients and said: I've had these thoughts for years but I couldn't formulate them, so why don't we think about sending in an application?Just a couple of months

later we were awarded a grant and we could make proof of concept studies. It was like a straight line shooting up in the sky directly.

Another interviewee agrees with the importance of these opportunities and suggests that the collaboration supports these:

The best research is multi-disciplinary and crosses existing borders.

A grant recipient describes how their work has brought together two disciplines:

We were able to bring together two very distant disciplines, psychoneuroendocrinology and dynamical systems theory, in order to describe on chemical and kinetic basis the integration of biochemical pathways that constitute the neuroendocrine system and better understand the derangements of its activity in common neuropsychiatric diseases.

Some collaboration has been established within medical simulation, as encouraged by planning documents. Simulation projects have been presented at the yearly conference and guided visits offered at the simulation centers in connection to the conference. The planning documents suggest formalizing a process for semi-sabbaticals which has not yet been implemented. However, shorter informal sabbaticals have taken place. Interviewed researchers supported the idea of sabbaticals, but it is possible that a formalized agreement is not necessary, instead this may be considered as an addition to the current grant structure. A formal process for cross appointments between the institutions have not yet been established, however none of the interviewees suggest this to be a priority. Accelerated health care progress was one of the objectives with the collaboration, albeit it is hard to assess the realization of this objective within the time frame and scope of this evaluation, clinical trials are now underway, as an outcome of the collaboration.

A key administrative accomplishment was the award in 2014 of The Swedish Foundation for International Cooperation in Research and Education (Stiftelsen för Internationalisering av högre utbildning och forskning, STINT) to support the infrastructure and management of the collaboration at KI. The award was a two-year grant for 1,000,000 SEK (about \$110,000). This award allowed for several administrative projects to be initiated and completed such as signed master collaboration agreement, facilitation for exchange of data and materials between the two organizations, task forces for innovation, value-based health care, and administration. It also allowed for development of the joint website describing the collaboration is in place, and each year, summaries of the collaborative work are printed and distributed, furthermore, podcasts have been produced, describing the collaboration.. One important component of the collaboration was also to establish a shared logotype/communication and this was accomplished in 2014 when a joint logo (on the title page of this report) was designed and approved by both institutions.

The mechanism for collaboration in terms of a steering group with regular meeting and administrative support at both institutions has been established and their work is highly valued by survey respondents and interviewees.

Limitations of the Evaluation

To conduct this evaluation, a number of data sources were explored, despite this, some lack of organized and accessible data was one of the major barriers the evaluation team encountered. This resulted in inadequate analysis of number of awardees (year 2013), PhD students, post-doctoral students, medical students' participation in the collaborations and the what, if any, the students and trainees benefitted from the collaboration. Lack of access to external grant data at KI limited the team's ability to perform a solid comparative analysis on awardees follow up grants and their ability to successfully acquire follow up funding. Self-reported grant information is highly unreliable and is a method not preferred for high-quality evaluation.

The very low response rate in the conference survey means that this data cannot be said to reflect the opinions of the majority of conference participants. The survey designed for this evaluation also had a low response rate (30-40%). Both the survey and the progress reports that all awardees have submitted focus on research collaboration and academic productivity so it is possible that aspects of interdisciplinary collaboration, innovation and administrative collaboration have been lost. The interviews provided insight from awardees and leaders only, consequently ascertaining outcome from the few that we have may not be appropriate as it only represents a few selected individuals.

Conclusions

In summary, the collaboration has been highly successful in creating a platform for researchers, leaders, administrators, educators, and students for international collaboration in a constructive, effective, and organized manner that has led to increased output of scientific, leadership, and academic material that will in turn contribute to improving healthcare. A number of areas for collaboration have been articulated and the steering committee has emphasized that the collaboration supports funding for all areas of research. There are numerous collaborative teams that have a strong ongoing partnership that would have been much harder to initiate and manage without the collaboration. The number of co-publications between the two institutions is increasing. A Master collaboration agreement between the institutions ensures continued collaboration and describes joint processes for legal, financial and innovation aspects of the collaboration.

Participants in the evaluation expressed great appreciation for the collaboration and all it entails and find the current structure with grants and conference very welcoming, positive, and successful. Many participants in the evaluation voiced the sentiment that their research would not have been possible without the formal collaboration and that the professional connections and research collaboration are invaluable to them and their work. The grants are described as a helpful 'framework' for the collaboration, an initiator for pilot research for further funding, and a tool to facilitate a clear focus.

The conference has been well attended and is found to be well organized and interesting where both the plenary speakers and the topics are of value. Participants use the opportunity to network and thus further their research by getting advice or forming collaborations. Their ideas about how the conference could get even better testify their engagement in the continuation of the collaboration and the conference.

The KI Mayo Clinic collaboration has been less successful in establishing collaboration within education in terms of formalized exchange of students and shared curricula. However, successful collaborative initiatives do exist and there is an ongoing exchange of medical students, PhDs and post docs, albeit these are not always 'traceable'.

The evaluation shows that the collaboration has been very successful in almost all areas it set out to work within and that it has expanded into further areas of research. It has provided the two institutions with a formal platform for initiating and supporting collaboration in science, administration, and education and it is a cornerstone for those interested in broader and bigger opportunities than each individual institution can provide as a separate and independent academic system.

Recommendations

Based on the growth and success of the collaboration the areas our recommendations focus on are related to administrative tasks and given the methodological limitations expressed in this report, we recommend some improvement in data management, as described below, to facilitate monitoring and sharing the success of the collaboration in the future. We also recommend that the steering committee initiate creation of an explicit evaluation plan that includes continuous monitoring for formative purposes as well as regular summative evaluations.

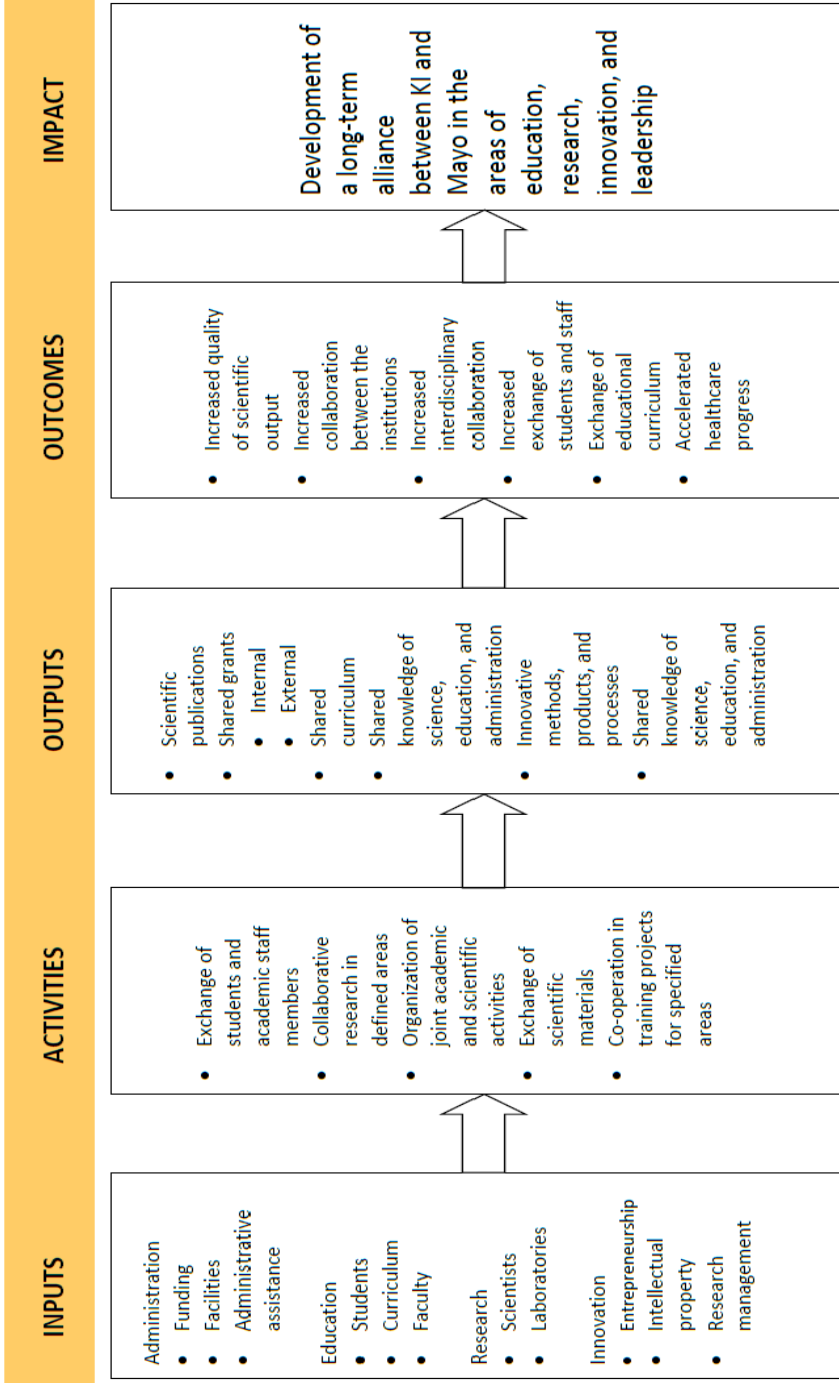
- Move management of the collaboration to a database instead of Excel and Word documents. Administrators at both KI and Mayo Clinic should have access to this data base. The database can provide coherent information on each individual: which conferences they have attended, grants applied for, grants awarded and final reports. At a later stage this database may be linked to academic output such as publications and external grants.
- Another corollary of the success of the collaboration is the need to provide an annual focus of the collaboration such as sustainability, innovation, healthy life style, person centered care, etc. or defined groups (e.g., 2018 could be the year of initiating semi-sabbatical for faculty, and 2019 could be the year for student participation).
- Revision of both the content and administration of the final report of the grant. An electronic format is likely to be preferred and facilitates the possibility to link grant applications with the final reports in a database. The content of the survey for the final report should be revised to better reflect the different aims of the three grants. Questions should be added to the survey regarding students and PhD students benefiting of the collaboration, including their name and contact details to allow for follow up data collection.

We recommend that the steering committee considers the following changes regarding the conference:

- There is some confusion among conference participants and chairs on the purpose of the education track. The committee should consider clarifying that the purpose of the track is to share innovation and ideas in education. The education track may also benefit from a clearer statement regarding which level of education or training the track wants to focus on.
- Standardized processes for grant support at the conference where pre-scheduled appointments are encouraged have been thought of as most successful. Additional drop-in consultation could be available for a limited number of individuals.
- We recommend that the steering committee considers whether alternative models should be explored such as separate track meetings or biennial conference.
- Begin conference planning earlier in the year to allow for improved potential of recruiting speakers. It would be beneficial if the call for the conference and the preliminary program was ready in June. The committee may also want to consider whether the application process with abstract should be the same at both institutions.
- Revision of both the content and administration of the conference survey, an electronic format is likely to be preferred.

Appendix A

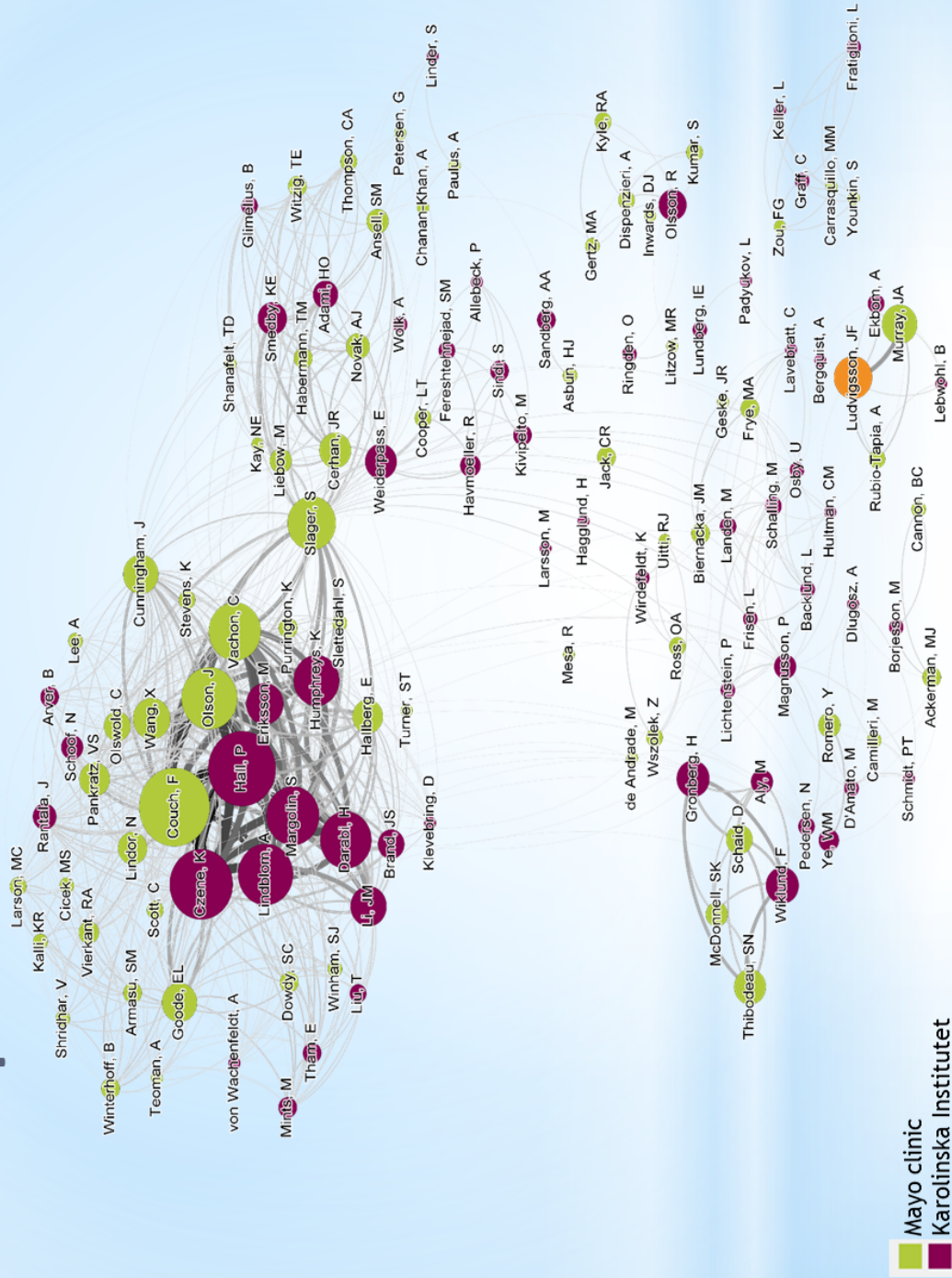
Karolinska Institutet – Mayo Clinic - Collaboration Logic Model



Logic model was extracted from various planning documents

Program management - Program resources

Co-publications Authors 2013 – June 2016



■ Mayo clinic
■ Karolinska Institutet
■ Double affiliation

Authors need at least three copublications to be shown in this picture.

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