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Department of Learning, Informatics,
Management and Ethics
Medical Management Centre
Innovative Care Group

Innovative Care Report 1

Meeting the future through bio-behavioral healthcare sciences

Innovations for Healthcare Science

*Lars E. Eriksson and Carol Tishelman for the Bio-behavioral Travel Team**

30 May 2016

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**Karolinska
Institutet**

Background

Establishment of a Chair in Innovative Care

The call for the establishment of an endowed chair in innovative care was motivated by a need to address a multitude of challenges, including the aging population with increasing chronic diseases and multiple comorbidities; continuing breakthroughs in biomedical and medtech research which change care strategies and needs; and the increasing provision of care outside hospital environments. Meeting these challenges calls for investment in healthcare science research, education, and innovation.

To meet these challenges, Investor AB donated SEK 10 million in 2013 to the establishment of an endowed Chair in Innovative Care at Karolinska Institutet. This competitive position, which integrates health and social care research, was awarded to Professor Carol Tishelman in October 2014 and is based at the Department of Learning, Informatics, Management and Ethics (LIME) where she leads the Innovative Care research group (ki.se/en/lime/innovative-care) with Assoc. Prof Lars E. Eriksson. Tishelman has a joint position with Karolinska University Hospital, Center for Innovation, as University nurse with responsibility for strategic healthcare innovation.

The Stated Mandate of the Chair in Innovative Care

According to the call for this position, the Professor in Innovative Care will:

- *“...have the responsibility to **establish and direct a Research, Development and Education Centre for Innovative Care** at Karolinska Institutet. The Centre will collaborate with other universities in the region and health care commissioners that will participate in funding the center, i.e. Stockholm County and Stockholm Municipality.”*
- *“... lead research and participate in teaching in the area of Innovative Care. The professor will also contribute to the **development of health care services, processes and systems by active collaboration with authorities, providers and patients...**”*
- *“...be expected to **innovate in research and implementation methods** in order to achieve visible improvements in care and outcomes, as well as high quality research methods...”*

(see Appendix 1 for the full call)

Two strategic recruitments have been made through the new position to begin to address its mandates. Administrative resources have been redirected to Dr. Sophia Savage, to conduct a scoping exercise to better understand the extent to which existing innovation systems in the Stockholm area, particularly at KI, presently address issues related to healthcare sciences and collaborate with healthcare scientists and educators today.

Associate Professor Lars E Eriksson has been recruited to develop the relatively young research field called “bio-behavioral nursing research”, with help of SEK 800 000/year funding from SFO-V designated for a senior researcher to work with the new chair. Funding for both positions has been complemented by 300 000 SEK for 2015 from the KI Board of Research to, in part, support the scoping exercise by Savage and the report presented here.

Given KI’s reputation and focus on high quality research in life sciences, we propose that one direction for contributing to new cutting edge research, education, and innovation, is by developing the research field of “bio-behavioral nursing science”. Bio-behavioral nursing can be viewed as the intercept between biological sciences, behavioral sciences and nursing science. This has been defined as “a scientific

approach to the study of the complex interactions among biological, social, behavioral, and environmental factors and their effects on outcomes”

(<http://www.nursing.upenn.edu/bbrc/Pages/Mission-Statement.aspx>). While the field is growing in the US, in part through the efforts of the National Institute of Nursing Research (NINR) at the NIH, it remains virtually non-existent in Sweden today. For over 15 years, the NINR has recognized and argued the importance of combining sophisticated knowledge about biological processes with more traditional nursing knowledge about symptom experiences and resulting behavioral responses. Furthermore, the National Institutes of Health (NIH) and NINR have emphasized that meeting the health challenges of the future calls for the inclusion of healthcare science perspectives in multi-and interdisciplinary collaboration with a variety of disciplines, including life scientists and clinicians.

With this in mind a scoping visit to established centers for bio-behavioral nursing research in the US, was carried out to explore and highlight possibilities, pitfalls, and directions for developing this field at KI.

Executive summary

During the period 14 to 25 September 2015 the team (Professor of Innovative Care Carol Tishelman, Medical Management Center, Department of Learning, Informatics, Management and Ethics; Professor of Medical Proteomics Janne Lehtiö, Cancer Proteomics Mass Spectrometry Group, Department of Oncology-Pathology/Science for Life Laboratory; Docent in Care Sciences Lars E. Eriksson, Medical Management Center, Department of Learning, Informatics, Management and Ethics; and PhD Sophia Savage, Medical Management Center, Department of Learning, Informatics, Management and Ethics) visited the following four US institutions to better understand how they worked with the subjects of bio-behavioral and translational nursing research and innovations in healthcare sciences:

- National Institute of Nursing Research (NINR) at the National Institutes of Health (NIH), Bethesda, Washington DC,
- School of Nursing, University of Pennsylvania (UPenn), Philadelphia, Pennsylvania
- School of Nursing, University of California San Francisco (UCSF), San Francisco, California
- School of Nursing, University of California Los Angeles (UCLA), Los Angeles, California.

National Institute of Nursing Research, NIH

The NINR is the largest federal agency dedicated to support of nursing science. Grants are available for academic institutions, but also for hospitals, small businesses and other institutions and agencies across the US. The NINR has been exceptional in nursing contexts in its early support for bio-behavioral nursing research. While bio-behavioral research is a focus transcending the NIH's specific strategic areas, it is most predominant in the focus area on symptom science. Importantly, their focus on symptoms is disease agnostic, focusing on the symptom regardless of diagnosis and is operational, rather than specifically labelled bio-behavioral.

One area of discussion related to pre-requisites needed for bio-behavioral nursing research, to allow communication among disciplines and the development of fruitful research questions. This issue is a recurrent theme throughout our trip, addressed by most of the people we met. To paraphrase and summarize the NINR position: “You have to get people into the labs, to learn the basics, to be prepared for collaboration; otherwise it will not be a true collaboration. If there is no language in common, collaborations will not take hold”. One clear message is that it is essential to define each individual's

area of expertise in multi-, inter-, and trans-disciplinary research. For example, nursing science can add additional layers of data which can impact on the molecular level, but what this consists of, what each individual “brings to the table”, needs to be clarified from the onset, as this is only discipline-specific.

Another discussion point here is what level of knowledge needs to be shared—what do nurses and other healthcare professionals need to know about other sciences to enable communication and how can this be achieved. There was consensus that some degree of basic knowledge is needed to enable a common language.

We also discussed different initiatives to support the development of bio-behavioral nursing research. One such was “add-on” funding, that is, increasing the “added value” of existing funded projects by making funding available for complementary data from another perspective, e.g. a healthcare science component added to existing biological research. Another NINR program, the Innovative Questions (IQ) initiative, derived from an “Idea Festival”, and aimed to initiate dialogue with NINR stakeholders to identify novel scientific questions. NINR sought thoughts and ideas that would encourage new thinking and creativity in nursing science, explore unanswered questions, promote results-oriented research, and guide nursing science over the next 5 to 10 years. The IQ initiative consisted of two components; a series of workshops, and a public website, and resulted in a list of key questions for each of the focus areas.

University of Pennsylvania School of Nursing

UPenn School of Nursing, ranked as #1 in nursing in QS world university rankings (KI is ranked as #5), is one of few institutions with a relatively long history in bio-behavioral nursing science. This focus is mirrored in the internal structure of the School, with one of its’ two departments, the Department of Biobehavioral Health Sciences, devoted to generation of new knowledge from both the biological and behavioral perspective. One research group, the Biobehavioral Research Center, is especially directed to research on the interaction of biological and behavioral factors in the promotion of health. The school also has its’ own lab facility specialized in methods related to analysis of heart/brain tissue. The School of Nursing has worked strategically to attract inter-disciplinary faculty to create an environment to broaden thinking “from cell to society”. During our visit we met a number of faculty involved in bio-behavioral and translational nursing research both on the structural level and in performing research in the area. We were introduced to a range of examples of research and initiatives to promote bio-behavioral and translational research involving patient-reported data, monitoring devices, apps and biomarkers in various populations, i.e. frail elderly, trauma and crime victims, and young people with cognitive impairments. Based on the recognition that economic incentives play an important role in fostering interdisciplinarity, one activity included new seed funding dedicated to lab facilities and analyses through a “Biomarker challenge grant” designed to encourage nurse researchers to include a biomarker component in ongoing research. The grant was directed to researchers who had not used biomarkers previously, in an effort to recruit younger researchers to this growing field.

Another activity aimed to bring nurse scholars to the research table earlier in their career. This involved recruiting students from year 3 of the 4-year Bachelor of Nursing Science program to the “Hillman Scholars program” in which students will start their PhD studies in parallel with completion of their undergraduate studies. It is also interesting that two-thirds of the students entering this program have a previous degree in another field, often up to Masters level, and that the number of applicants is high

and the program very competitive. The importance of fora to meet across disciplinary and methodological borders was also highlighted and facilitated through the arrangement of university-wide thematic events. In these, researchers active within a certain theme presented their work in 1 minute pitches, with 10 minutes for discussion. Also, the school engaged their inter-disciplinary faculty in internal peer-reviewing of grants before submission.

University of California San Francisco

Bio-behavioral research at UCSF School of Nursing was initiated with a focus in oncology, but in recent years has broadened its focus into an interdisciplinary symptom management research group, with investigative interest beyond specific diagnoses. In their facilities they have a molecular lab where they take in biological specimens (blood and tissue), isolate for DNA and RNA, and do prep work before sending the samples out to core facilities. They do most data analysis in house, but also collaborate with other labs.

Their research group meetings are attended by clinicians, physiologists, statisticians, psychiatrists and other interested parties at different academic levels, including students. These regular conversations with different disciplines present are said to be crucial for generating better research questions and more qualified and sophisticated ways of addressing them. The different lenses that people bring to the table when discussing data, were emphasized as increasing the quality of the resulting publications.

An example of their research is a study of the phenotypic and genetic profiles of patients with high versus low symptom burden during cancer treatment. Based on their long experience of research in this area, they are unconvinced that symptomology is only disease-specific, but hypothesize that genetic predisposition for high symptom burden is more relevant than diagnosis, and that this is relevant across disease groups.

University of California Los Angeles

The bio-behavioral research at UCLA School of Nursing showed somewhat more diversity and greater focus on technology and translation processes in formalized collaborative forms than the other institutions we visited. Formal channels for interdisciplinary collaboration have been established through, e.g., the Wireless Health Institute where engineering/computer sciences faculty works closely with faculty from nursing and medicine. Comparable and in addition to the discussions we had with other institutions about competencies necessary for Bench-to-Bedside research collaboration, at UCLA the need for RNs to have an introduction to business models as preparation for type 2 research translation processes results into broader service practice was emphasized.

The collaboration between public health, engineering and medicine in the faculty, as well as tenure track possibilities, were found to attract interdisciplinary faculty to this school. The faculty established a mentoring system to help young faculty members to get grants as support for career development. New faculty have 25% of their position for research and are expected to apply for and receive intra-mural small grants the first year and publish at least two publications annually from their second year of employment. Formal reviews of their performance are performed on the 2nd, 4th and 7th year (when up for tenure).

Summary comments

Although we visited institutions which focused on nursing science specifically, we would argue that much of what we have seen and learned is relevant for healthcare sciences as a whole, and not only nursing science. In general the institutions we visited all addressed well formulated research questions about how to combine biological (symptom markers) or physiological conditions (e.g. pain or sleep deprivation) with other data to contribute to nursing research. These biological and physical measures were used as parameters for basic research and implementation research to improve knowledge and outcomes.

However, in several studies biological sampling or measurement data was lacking or the selection of biological measurements seemed relatively ad hoc, based on availability of both measurements and human resources, e.g. someone “happened to have experience” in measuring a particular parameter. Both UPenn and UCSF had onsite laboratories where researchers conducted some laboratory research. The benefit of the laboratory was clearly the availability of dedicated persons. This led to establishment of some standard measurements that were used in many studies. The lab staff could also function as experts to provide advice on what could be done in terms of biological research. One risk we perceived is the small laboratory unit size which is not competitive compared to larger experimental labs. It also seemed to be difficult to maintain a critical mass of cutting edge expertise for researchers to be able to contribute with a wide range of potential laboratory measurements, with a risk that the facilities available function to limit the research questions addressed and methods applied. Also, some aspects of the laboratory science in place seemed to drift from relevance for healthcare sciences to a pure lab science focus.

One observation based on our site visits was the general lack of collaboration between healthcare sciences and omics research. This was mainly due to the fact that omics research is generally performed via core facilities which often lack expertise to support study design and data analysis. Also, the interdisciplinary “language barrier” is a potential obstacle prohibiting initial phases of collaborative ventures. We are convinced of the potential in conducting exploratory bio-behavioral research studies if healthcare scientists also collect biological samples and link these data to omics research. This can open possibilities for discovery research on specific symptom markers and symptom etiology—disease specific or across diseases—increasing potential for development of novel treatments.

In conclusion, bio-behavioral healthcare science research can add valuable data layers to any omics studies performed on biological samples from the same cohort, and omics data can enrich understanding of bodily experiences central in healthcare science research. This layering of data can even be used to discover novel connections between data sets and to elucidate confounding factors affecting observed molecular changes. Moreover, in strategic terms there is significant value in generating many overlapping data layers for a cohort, including healthcare science data, outcome data, drug response data, genomics, transcriptomics, proteomics etc. This provides research opportunities that maximize the use of collected data and diminish risk for false interpretations.

To optimize the possibilities inherent in this type of multi-, cross-, or transdisciplinary collaboration, the bio-behavioral research questions should be well defined from healthcare sciences/nursing perspective in order to add relevant biological measures to studies. A basic requirement should be that the a healthcare science study should generate unique data in itself, with additional biological data collected;

the biological data then needs to be analyzed in relevant ways and linked with healthcare science data. This could increase the likelihood of novel outputs.

Recommendations for KI

We conclude that given KI's reputation and strength in research in life sciences, Innovations in healthcare science at KI should include an expansion on bio-behavioral healthcare sciences, as one of many directions. It is crucial for healthcare sciences' development that the investments in core facilities in life sciences are intended for multi-and transdisciplinary use, and that measures are taken to overcome existing hinders to such collaboration. At present these hinders include a lack of a critical mass of interested researchers, limited forums for cross-disciplinary contact including healthcare scientists, lack of common language and limited familiarity with life sciences among healthcare professionals and researchers.

Suggestions to overcome these and other structural hinders include:

- Developing systematic and proactive, rather than reactive, structures and initiatives to stimulate cross-disciplinary and innovative research
 - Stimulate a disease agnostic approach
 - Active research calls with steering function
 - Add-on funding: small grants for healthcare sciences to add biological components to existing research and for other researchers to add healthcare science components. Bilateral exchange can provide a basis for future collaboration
 - Fellows-in-residency exchange program between e.g. pre-clinical and healthcare sciences; epidemiology and healthcare sciences
 - Idea festivals
- Working proactively to overcome and diminish communication problems between different disciplines through educational initiatives
 - Develop initiatives that offer basic orientation to different disciplines
 - Introduction of basic elements from newer sciences, e.g. omics, in the undergraduate programs of healthcare disciplines and the basic elements from healthcare sciences for in the undergraduate programs of relevant non-healthcare disciplines
 - Initiate and collaborate on healthcare science courses for junior researchers, doctoral students, and masters level students on issues to stimulate future research in new areas
 - Initiate a collaborative international course for those interested in bio-behavioral research
 - Second degree programs in nursing and other healthcare sciences—
 - Such programs have functioned for recruitment to healthcare sciences, and to facilitate cross-fertilization between disciplines in e.g. the U.S. and the U.K.
- Using core resources to create a facilitator position to proactively work to link healthcare sciences and core life science facilities
 - Designated researchers with broad and extensive research experience need to be affiliated with core facilities, with a mandate to support development of new cutting edge and interdisciplinary research and actively work to overcome existing hinders



Investor's Professorship in Innovative Care, with possibility to combine with a clinical position within Stockholm County Council

Karolinska Institutet, En av KIs institutioner

The ageing population, and the increasing prevalence of chronic diseases constitute formidable challenges for health and social care. Continuing breakthroughs in biomedical research will provide opportunities for individualized treatment, at the same time as patients and relatives increasingly wish to participate in decision-making and the management of their care. Meeting these challenges calls for considerable investments in health care research and innovation as well as in the redesign of health professions education will therefore require more investment in health care science and innovation and in the training of caregivers.

Investor AB donates SEK 10 million over a period of five years to fund a Chair in Innovative Care at Karolinska Institutet in order to support the development of world-class welfare services in Sweden.

Duties

The Professor in Innovative Care will have the responsibility to establish and direct a Research, Development and Education Centre for Innovative Care at Karolinska Institutet. The Centre will collaborate with other universities in the region and health care commissioners that will participate in funding the centre, i.e. Stockholm County and Stockholm Municipality.

The Professor will be able to draw on Karolinska Institutet's Strategic Research Programme in Care Science, a centre of excellence built around five thematic areas of health care research: i) Women's and child health, ii) People with long-term illness, iii) Elderly with reduced mobility and participation, iv) Cancer and palliative care, and v) Health care systems, policy, management, economics and informatics. Through the programme, the Professor will have access to health care delivery organisations and communities of patients and families. If the Professor has a health professions education a dual appointment at Karolinska Institutet and The Stockholm County Council will be possible.

The Professor will lead research and participate in teaching in the area of Innovative Care. The professor will also contribute to the development of health care services, processes and systems by active collaboration with authorities, providers and patients. The position includes:

- secure research funding from grant funders and health service providers to develop the programme,
- publish in high quality peer reviewed journals as well as professional and popular publications,
- establish and lead successful research projects of internationally leading quality,
- collaborate with other departments, disciplines, patient groups and care providers to produce applied research which contributes to knowledge and improved patient care

Entry requirements

All professors at Karolinska Institutet must demonstrate scientific as well as pedagogical competence. The applicant must have proven ability to secure external research funding as well as establish and lead successful research projects of highest international quality. A track record of publishing in high quality peer-reviewed journals as well as in professional and popular fora is required. Good interpersonal skills demonstrated in collaboration with other disciplines, departments, patient groups and care providers are also required.

The Professor will be expected to innovate in research and implementation methods in order to achieve visible improvements in care and outcomes as well as high quality research methods. Demonstrated ability to cross boundaries of many types - academic, disciplinary, service and sector - will be important, as well as demonstrated

Appendix I

experience in innovative experiment and development of projects.

Bases of assessment

The assessment will weight qualifications as follows: research expertise (3), educational expertise (1), leadership, development and collaboration expertise (2).

Application process

An application must contain the following documents in English curriculum vitae, qualifications and description of planned research, presented in accordance with Karolinska Institutet's qualifications portfolio (<http://ki.se/qualificationsportfolio>).

The application is to be submitted on the NetRecruiter system.

Karolinska Institutet är ett av världens ledande medicinska universitet med visionen att på ett avgörande sätt bidra till att förbättra människors hälsa. I Sverige står Karolinska Institutet för den enskilt största andelen medicinsk akademisk forskning och har det största utbudet av medicinska utbildningar. Varje år utser Nobelförsamlingen vid Karolinska Institutet mottagare av Nobelpriset i fysiologi eller medicin.

Enligt Riksarkivets föreskrifter arkiveras ansökningshandlingar i två år efter att tillsättningsbeslutet vunnit laga kraft. Detta gäller dock ej bilagor som är tryckta eller på annat sätt publicerade.

Karolinska Institutet strävar efter att vara en arbetsplats med jämn könsfördelning som är fri från diskriminering och ger lika möjligheter för alla.

Till bemannings- och rekryteringsföretag och till dig som är försäljare: Vi undanber oss vänligen men bestämt direktkontakt med bemannings- och rekryteringsföretag samt försäljare av ytterligare jobbannonser.

Anställningsform Tillsvidareanställning

Anställningens omfattning Heltid

Antal lediga befattningar 1

Sysselsättningsgrad 100%

Ort Stockholm

Län Stockholms län

Land Sverige

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**Karolinska
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