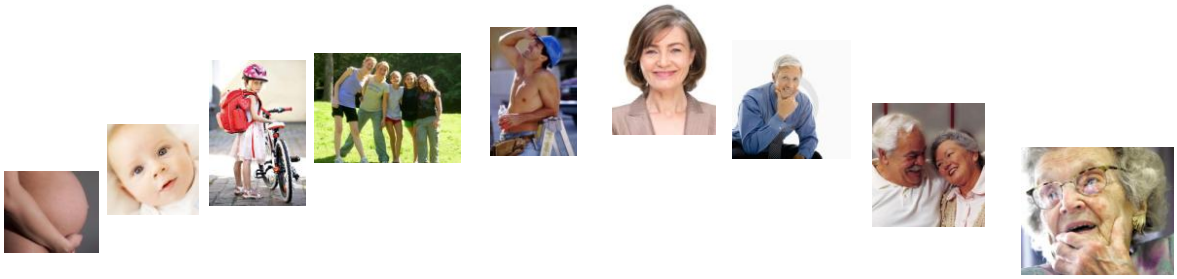

A lifetime of healthy muscles, joints and bones

Research Unit for Clinical Biomechanics
Institute of Sports Science and Clinical Biomechanics

University of Southern Denmark

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Research plan of action 2010-2015

Preface

The goal of clinicians and health care systems is to improve people's health. Unfortunately, many times we don't know how, and too often preventive efforts, diagnosis and treatments are based on tradition, subjective opinions and trial-and-error. This appears to be particularly true for patients suffering from pain and functional limitation from the musculoskeletal system. On top of this, many commonly used treatments have not been shown to convincingly alter the natural course of these conditions.

One of the answers to this challenge is research. More research, better research, and research addressing the questions that are important to patients and societies. Research that is carried out by researchers with different professional backgrounds in unprejudiced collaborations and environments. At the Research Unit of Clinical Biomechanics it is our goal to contribute to this endeavor and that is why we are now putting forward this new research plan of action 2010-15.

Musculoskeletal disease, pain, and disability start early and may continue throughout life. That is why our research will focus on the longitudinal perspective – from cradle to grave - in order to identify factors that can effectively alter the course of these conditions. We need more knowledge about the occurrence, course, and prognosis of musculoskeletal disorders in order to identify high-risk groups that could be targets for prevention; we need knowledge about what affects prognosis in order to target modifiable factors; we need a better understanding of the pathophysiological and behavioral mechanisms affecting initiation and prognosis in order to design effective interventions; we need better and valid clinical tools for diagnosis, treatment and rehabilitation in order to effectively treat patients; we need reliable, valid, and responsive outcome measures that are measuring the parameters that are important to patients ; we need a better understanding of the societal mechanisms influencing how musculoskeletal conditions affect individuals and societies. Therefore this five year plan is broadly based with activities and specific aims for research in all of these areas that together will contribute to a better understanding of musculoskeletal health in the lifetime perspective.

It is timely for us to put forward a new research plan for several reasons. First, the Research Unit for Clinical Biomechanics has recently been reshaped as a result of structural changes at the Faculty of Health Sciences. Second, the Institute of Sports Science and Clinical Biomechanics has been expanded and strengthened with several new groups and high profile researchers resulting in improved possibilities for multidisciplinary research. Finally, the research unit has formed a center partnership with the Nordic Institute of Chiropractic and Clinical Biomechanics, which will relocate to the university campus in close connection with the unit in 2012.

Fulfilling the ambitions outlined in this plan will require hard work for all involved. But answering the questions one by one is needed and will also be both fulfilling and fun. Hopefully over time we can contribute to the common goal: To improve people's health.

Jan Hartvigsen
Professor and Head of Research Unit
March 2010

Research Unit of Clinical Biomechanics missions

Research

Through collaboration with national and international partners to produce high quality and relevant research related to pain and disability of the musculoskeletal system in general and the spine in particular. Through this effort to continually develop the basis for evidence-based education within the musculoskeletal field at the Faculty of Health Sciences at the University of Southern Denmark.

Education

To provide evidence-based teaching for the educations at the Faculty of Health Sciences at the University of Southern Denmark including education of young researchers. Further, to contribute to dissemination of evidence-based knowledge within the musculoskeletal field in other educational and patient related contexts.

Administration and Development

To manage, coordinate, and develop research and education within the Faculty of Health Sciences at the University of Southern Denmark.

Work environment

To provide a supportive, collaborating, and engaging work environment with possibilities for personal development, multidisciplinary and international collaborations. Further, to support a healthy lifestyle and a sensible balance between work and family for employees in the unit.

Research Unit of Clinical biomechanics staff winter 2010

Jan Hartvigsen	Professor. Head of Research Unit
Tom Bendix	Professor
John David Cassidy	Honorary Professor
Per Kjaer	Associate Professor
Lise Hestbaek	Associate Professor
Henrik Hein Lauridsen	Assistant Professor. Director of Studies, Clinical Biomechanics
Corrie Myburgh	Assistant Professor
Lotte O'Neill	PhD Student
Mette Jensen Stochkendahl	PhD Student
Erik Poulsen	PhD Student
Rune Mieritz	PhD Student
Michele Maiers	PhD Student
Roni Evans	PhD Student
Craig Schulz	PhD Student
Maria Cecilie Vonsild	PhD Student
Anne Moelgaard Nielsen	Scientific Assistant
Birgit Bruunshøj	Scientific Assistant
Sanni Madsen	Scientific Assistant
Lone Kjaergaard Larsen	Research Secretary
Anni Johansson	Study Secretary

Epidemiological Research

Epidemiological research deals with mapping of health and disease in populations and studying factors affecting initiation and prognosis.

The course of musculoskeletal disorders (MSD) and the factors affecting prognosis are not well understood. This is because there is a lack of longitudinal studies investigating these prevalent conditions which occur at all ages, in clusters, and very often alongside other health problems of both physical and psychological natures in complex social contexts. A “pain in the back” or in another body location is no longer always being regarded as an isolated disease entity but in many instances as an expression of overall poor health in the individual. Depending on co-occurring symptoms and diseases, ability to cope with pain, psychological well-being, and social factors, presumably simple pains can therefore have very variable courses in individuals and result in different consequences. Mapping of such patterns and longitudinal studies reporting on the course and prognosis in groups of the population has recently provided new insights and it is likely that future epidemiological studies will bring forward crucial evidence that will fundamentally change the way we manage MSD.

In Denmark we have unique opportunities for epidemiological research using the large population-based databases and public registries. These data sources are easily and cheaply accessible and information can be combined using the person-specific *cpr* number which is assigned to all Danes by law.

Researchers from The Research Unit for Clinical Biomechanics have published extensively in this area using data from The Danish Twin Registry and Statistics Denmark. These collaborations will be strengthened and expanded and new data sources such as the Danish National Cohort Study (DANCOS) and new quality assurance databases in the Region of Southern Denmark will be incorporated.

Specifically, we will

- Investigate and map patterns of co-occurring musculoskeletal and other health complaints at all ages
- Study the longitudinal course of these patterns in relation to impact on quality of life and consequences in the form of seeking of health care, functional limitation, change in participation in social life and sports, and loosing work
- Identify predictors of consequences and prognostic markers both in population-based and patient populations
- Study how clinical, anamnestic, psychosocial, and physiological information can be combined in defining clinically relevant subgroups
- Participate in prognosis research based on advanced statistical models in cohorts aiming at identifying groups of patients with particularly poor or particularly good prognoses

Basic Science and Mechanistic Research

Basic science and mechanistic research deals with uncovering physiological mechanisms underlying normal and abnormal function of the human body. Within this branch of research the mechanisms of action for treatments are also studied.

The pathophysiology behind most musculoskeletal pain is not well understood. This is unfortunate because an understanding of underlying mechanisms is a prerequisite for designing preventive efforts and effective treatments that will target these mechanisms. Fundamental to many conservative treatments is the concept that altered or diminished function in the muscles and/or joints and that such dysfunction must be corrected and returned to normal in order for the condition to improve. However as long as normal function and normal variations are poorly understood it is difficult to define dysfunction and to operationalize this concept in evidence based clinical settings.

At the Institute of Sports Science and Clinical Biomechanics unique opportunities for collaboration between scientists with clinical backgrounds and basic science/physiology backgrounds exist. Such collaborations within the areas of biomechanics and muscle physiology has already yielded good results and because new research facilities containing state of the art laboratory and clinical facilities will be finished in 2012, opportunities for combining clinical studies with physiological measurements will be strengthened. Furthermore, scientists in the research unit have a well developed national and international network of collaborators that will facilitate such research endeavors.

Specifically, we will

- Investigate how regional and segmental spinal motion relate to normal and abnormal spinal function, pain and functional limitation
- Study the contractile abilities of muscles in the neck and how these relate to neck pain and headache and the presence of myofascial trigger points
- Determine how commonly used conservative treatments such as manipulation, dry-needling, and exercise affect pain, spinal motion, and muscle function
- Participate in the development and validation of new technologies that will provide specific feed back to patients about biomechanics and muscle function
- Use MRI to study factors that affect muscle growth and degeneration in teenagers
- Investigate how specific genetic patterns and candidate genes influence the development of spinal abnormalities and disc degeneration

Clinical Research

Clinical research is dealing with validating diagnostic procedures and determining the effectiveness of interventions.

In many musculoskeletal disorders reproducible and valid diagnostic methods are lacking and it remains largely undetermined which interventions will benefit and effectively alter the natural course of these conditions. Therefore focus areas for the clinical research effort will be development and evaluation of clinical and diagnostic tests, cohort and randomized clinical studies dealing with preventive interventions, and cohort studies and randomized studies dealing with treatment of patients with painful conditions of the musculoskeletal system.

New facilities for clinical research at the Institute of Sports Science and Clinical Biomechanics and the relocation of Odense University Hospital to the university campus area open up new possibilities for multidisciplinary patient oriented clinical research for the research unit. In addition, the new research facility offers new and unique facilities for combining clinical research with basic science physiologic research and experiments with implementation of new technologies in musculoskeletal treatment and rehabilitation. Finally, closer formalized collaboration with the Nordic Institute of Chiropractic and Clinical Biomechanics will enable access to primary sector research through NIKKBs network of primary sector chiropractic clinics and collaborations with medical primary care research units.

Specifically we will

- Evaluate reliability and validity of commonly used clinical tests and diagnoses in relation to pain and dysfunction in the spine and extremities
- Conduct and participate in studies aiming at identifying predictors of outcome of prevention initiatives and treatment
- Conduct randomized clinical trials comparing the effectiveness of manual treatments, exercises, and other interventions in pain and functional limitation in the spine and extremities
- Participate in research evaluating the effect of new technologies such as robot technology in the prevention and treatment of MSD

Methodological Research

Methodological research aims at improving research methodology and statistical methods in order to more precisely answer research questions.

This branch of research is particularly important in relation to MSD because methods for measuring both the presence of conditions and the outcomes of treatments are not well developed. In particular, research aiming at validating the tools used for measuring function and quality of life in MSD patients is needed because without reliable and responsive tools the ability to select the right patients and evaluate the effect of treatments is compromised. Another important focus area is development of methods capable of combining extensive information from databases, cohort, and clinical studies in order to identify clinically relevant subgroups of patients that appear to have particularly good or particularly poor prognoses. Finally, progress in methodology relating to synthesis of evidence in systematic reviews and statistical analysis of longitudinal studies investigating episodic conditions are needed.

Specifically we will

- Whenever feasible, clinimetric evaluations of questionnaires and outcome measures used in clinical studies will be incorporated in study protocols
- Translate existing outcome measures into Danish and evaluate of their clinimetric properties
- Participate in the development of new improved condition specific outcome measures
- Participate in methodological workshops and development of improved methodology in systematic reviews
- Participate in methodological workshops and development of improved methodology in relation to multivariate longitudinal analyses of complex conditions
- Participate in research aiming at developing methods in sub-group research

Health Services Research

Health services research is aimed at exploring, describing, and explaining phenomena in the way health care is organized and delivered.

The implications of illness stretch beyond the individual and impact society at a variety of different levels and in MSD, the cost of management places an ever growing burden on society. Health care delivery in musculoskeletal disorders is many times diffuse and roles are not clearly allocated among the various health care professionals. Thus, research aimed at developing and improving health care delivery is of significant importance. If carried with the necessary methodological rigor, social research provides important clues as to where other types of research might focus in order to maximize available resources.

In Denmark the integration of chiropractic into both primary and secondary health care settings provides a unique opportunity to study how clinical, organizational, financial, and political factors interact and how integrated delivery of health care for MSD evolves when a new profession in introduced. Habits and attitudes of both chiropractic practitioners as well as clinicians with other backgrounds are challenged and new patterns of and practice models are evolving.

Specifically we will:

- Describe and study the role of chiropractic services in the Danish health care sector
- Describe and study the development of integrated delivery of musculoskeletal health care services in hospitals with special focus on chiropractic
- Describe and study the development of an appropriate inter-disciplinary practice model for Danish primary health care sector with special focus on the roles of chiropractic