HCTM

ASSOCIATION FOR HEALTHCARE TECHNOLOGY AND MANAGEMENT

1st International HCTM PhD Workshop
"Contributory membership"

Vienna, 30.-31. August 2004

hosted by:
University of Vienna, Austria

Local Organizers

Associate Professor
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School of Business, Economics, and Computer Science
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Thanks are due to Mag. Wilfried Fabjani, Renate Kemedinger, Mag. Markus Kraus, Mag. Wolfgang Zeppelzauer for their assistance in organizing this conference.

Expert Panel

Active in the HCTM network, all panel members are experts in the field of Health Care and Technology Management. In total the expert panel will consist of 9 people, of which the 7 mentioned underneath will participate:

Name	**Organization**	**Country**
Prof. Ruth Davies	Warwick Business School	United Kingdom
Prof. Elie Geisler	Illinois Institute of Technology	USA
Andrei Issakov, M.D., M.P.H., Ph.D.	World Health Organization	Switzerland
Prof. Koos Krabbendam	University of Twente	The Netherlands
Dr. Marion Rauner	University of Vienna	Austria
Prof. Murako Saito	Waseda	University Japan
Dr. Roel Schuring	University of Twente	The Netherlands

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Bank Austria We are grateful to Bank Austria for sponsoring the memo pads and ball point pens.

Vienna Convention Bureau Thanks are due to Vienna Convention Bureau for the touristic information material on Vienna and for the conference bags.

Contents

The Association for Health Care Technology and Management (HCTM)

Health Care Technology Management (HCTM) is about redesigning the health care delivery system. Major transformations are occurring in the delivery of healthcare worldwide. Medical and healthcare technologies are increasingly impacting the clinical as well as the administrative dimensions of healthcare care delivery. Innovations introduced in the last decade have created accumulated effects that will be compounded with the continuing technical progress in medicine. Areas such as telemedicine, telehealth, computerized medical records, e-health and use of the Internet in B2B and B2C applications in healthcare are some of the milestones in the almost total revamping of the healthcare landscape. Innovations in medical and healthcare technologies are already transforming the operations, design and mission of hospitals. In this regard, the challenges for the future are an exciting opportunity for study, reflection, planning, and intervention.

The Workshop

HCTM will hold its inaugural workshop for PhD students at the Institute of Business Studies, University of Vienna, August 30-31 2004 with the theme of "Contributory Membership."

The number of PhD students attending will be limited to 22 and ten international students from Austria, Canada, Sweden, The Netherlands, United Kingdom, and Senegal have enrolled.

A panel of experts on various aspects of research will hear a presentation from each student attending and will provide feedback and advice following the presentation.

In addition, there will be a number of presentations by members of the expert panel, covering a range of research methodology issues including:

- Metrics and Measurement
- Health Systems and Health Technology
- Health Care Technology Assessment
- Simulation as a Research Tool
- The Method of Arguments
- Health Action Process Design

More generally, the expert panel will also offer presentations on conducting literature reviews, establishing a relevant publication record and research design.

This will be a tremendous opportunity for PhD students to network internationally and begin to establish research relationships among peers from diverse backgrounds and with diverse experiences and interests. The program will be highly interactive and offers the opportunity for students to broaden their outlook on their own research and to contribute to the research of others.

Registration

• Fee

Before 1 June 2004	**After** 1 June 2003
€325	€ 375

The registration fees for students include: conference material, reception, lunches on Monday and Tuesday (Cafe Einstein), coffee and tea breaks, and the Conference Dinner on Monday (Rathauskeller).

• Registration

To register please download the registration form from the internet (http://www.hctm.net/events/PhD_Workshop_2004/PhD_Workshop_2004.html) and send it to Jeannette Visser by email or by fax **before June 15, 2004:**

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Information on the Meeting

We will meet in the following location:

University of Vienna, Austria
Sitzungssaal (meeting room) - behind the statue of emperor Franz Josef II (main entrance, left hand side, upper floor)
Dr.-Karl-Lueger Ring 1
A-1010 Vienna, Austria

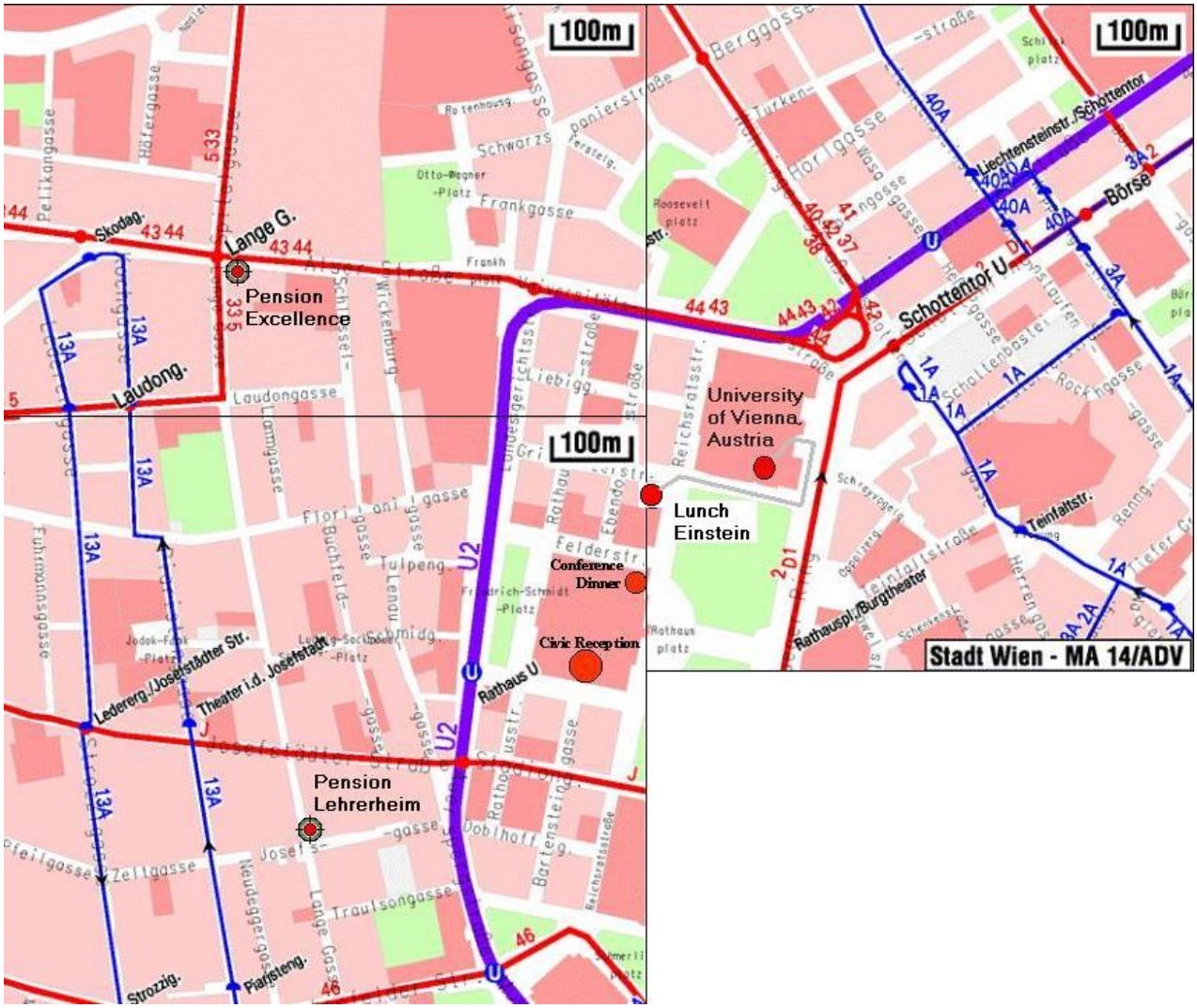
The organization team and the expert panel takes this opportunity to wish for a successful meeting and hope that you enjoy your visit to Vienna, in particular the University.

Information to all Participants

The Local Organizing Committee will be on hand Sunday, August 29th, 2004, 5 p.m. – 6 p.m. at the Pension Excellence, Alserstraße 21, A-1080 Vienna, Austria (Phone: ++43 1 407 96 20; Fax: ++43 1 407 96 20 11), for registration and a welcome drink. Afterwards all students and the expert panel can enjoy a nice evening at Universitätsbräu, the University brewery, opposite of Pension Excellence at the new University Campus (tables are booked for 6 p.m.).

Pension Excellence is in walking distance from the students' accommodation, Pension Lehrerhaus, Lange Gasse 20, A-1080 Vienna, Austria (Phone: ++43 1 403 23 58 100; Fax: ++43 1 403 23 58 69).

In case of emergency during the conference, you can reach Marion Rauner on her mobile phone (0699 1 95 66 212).



Scientific Program, Monday, August 30th, 2004

08.00 – 08.30	**Registration/Internet Access**	
08.30 – 09.00	**Welcome to HCTM**	**Representatives of the University of Vienna** **Organization Team** **Expert Panel**
09.00 – 10.00	**Methodology Session I**	**Chair: Professor Koos Krabbendam**
	Metrics and Measurement: Principles of Measurement in Empirical Research with Emphasis on the Measurement and Metrics of Technology Assessment	**Professor Elie Geisler** Illinois Institute of Technology USA
10.00 – 10.15	**Coffee Break**	
10.15 – 11.15	**Methodology Session II**	**Chair: Roel Schuring, PhD**
	Health Systems and Health Technology: Global Issues, Challenges, and Response	**Andrei Issakov, MD, MPH, PhD** World Health Organization Switzerland
11.15 – 11.30	**Coffee Break**	
10.30 – 12.30	**Methodology Session III**	**Chair: Professor Elie Geisler**
	Health Care Technology Assessment: The Principles of Cost-Effectiveness Analysis and Cost-Benefit Analysis	**Marion Rauner, PhD** University of Vienna Austria
12.30 – 13.30	**Lunch Cafe Einstein** Rathausplatz 4, A-1010 Vienna, Austria	
13.30 – 15.00	**Student Presentation I**	**Chair: Andrei Issakov**
	2004-2005 WHO Survey for Testing, The Framework for Linking Health Quality & Health Technology	**Thomas Judd** Kaiser Permanente USA
	Establishment of Management Systems for Achieving Effective Use and Sustainability of Health Care Technology in Developing Countries	**Roger Jean-Paul Schmitt** University of Capetown South Africa
15.00 – 15.15	**Coffee Break**	
15.15 – 16.45	**Student Presentation II**	**Chair: Professor Ruth Davies**
	A Markov Modeling of the Care Delivery Process for Stroke Patients after Discharged from the Hospital	**Beste Kucukyazici** Mcgill University Montreal, Canada
	Using Ant Colony Optimization and Discrete Event Simulation to Analyze Prevention Strategies for Coronary Heart Disease Initiated by Private Insurance Companies	**Wolfgang Zeppelzauer** University of Vienna Austria
20.00 – 22.00	**Conference Dinner** Rathausplatz 1, A-1010 Vienna, Austria	

Scientific Program, Tuesday, August 31st, 2004

08.00 – 08.30	**Registration/Internet Access**	
08.30 – 09.30	**Methodology Session IV**	**Chair: Marion Rauner, PhD**
	The Use of Monte Carlo Simulation, Discrete Event Simulation and System Dynamics in Health Systems Modelling	**Professor Ruth Davies** Warwick Business School Coventry, UK
09.30 – 09.45	**Coffee Break**	
09.45 – 10.45	**Methodology Session V**	**Chair: Andrei Issakov**
	Convincing Oneself, Convincing Others: the Method of Arguments	**Roel Schuring, PhD** University of Twente The Netherlands
10.45 – 11.00	**Coffee Break**	
11.00 – 12.00	**Methodology Session VI**	**Chair: Professor Elie Geisler**
	Health Action Process Design: the Case of Hospital Care Providers	**Murako Saito, PhD** Waseda University Japan
12.00 – 13.00	**Lunch Cafe Einstein** Rathausplatz 4, A-1010 Vienna, Austria	
13.00 – 14.30	**Student Presentation III**	**Chair: Roel Schuring, PhD**
	Using System Dynamics for Actor Collaboration at an Early Stage of Designing New Health Care Environments	**Marie Elf** University of Technology Gothenburg Sweden
	Testing the Focused Factory Approach for Indicated Elective Treatment Hospital Care	**Elco Bredenhoff** University of Twente The Netherlands
14.30 – 14.45	**Coffee Break**	
14.45 – 16.15	**Student Presentation IV**	**Chair: Marion Rauner, PhD**
	Internet-based Multiple Hospital Game	**Markus Kraus** University of Vienna Austria
	Healthcare Efficacy Improvement: Creating Value for Emergency Patients While Making Optimal Use of Healthcare Resources	**Remco Rosmulder** University of Twente The Netherlands
16.15 – 16.30	**Coffee Break**	
16.30 – 18.00	**Student Presentation V**	**Chair: Murako Saito, PhD**
	The Structure of the Influenza Vaccine Supply Chain and its Impact on Vaccination Efficacy	**Deo Sarang** University of California Los Angeles USA
	Exploring the Effectiveness and Equity of the UK Liver Transplantation Process	**Suchi Patel** University of Warwick UK
18.00 – 18.30	**Final Discussion**	**Chairs: Professor Elie Geisler and Professor Koos Krabbendam**

Methodology Session I
METRICS AND MEASUREMENT

Principles of measurement in empirical research
with emphasis on the measurement and metrics of technology assessment

Professor Elie Geisler
Illinois Institute of Technology, USA

The words most feared by doctoral students at the start of their dissertation are: "how would you measure this?". This workshop reviews the principles of measurement in empirical research - from the research question to developing measures of the variables to be examined in the research. The workshop also provides an illustration of the generation and usage of metrics in the assessment of technology and in particular health care technology.

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- **Geisler, E.,** *Managing the Aftermath of Radical Corporate Change*, Greenwood Publishing, 1997
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Methodology Session II
HEALTH SYSTEMS AND HEALTH TECHNOLOGY: GLOBAL ISSUES, CHALLENGES, AND RESPONSE

Andrei Issakov, MD, MPH, PhD
World Health Organization, Switzerland

While one-fifth of the world's population enjoys an average life expectancy approaching eighty years and a life comparatively free of disability, two-thirds living in the least well-off countries suffer overwhelmingly from the excessive burden of illness and premature death. Each year, an estimated 15 million children die from infection and malnutrition - 40,000 per day. Striking global disparities in health, and widespread high toll in illness and lifelong disability are a critical impediment to global economic and social stability.

Health needs of low- and middle-income countries present a layered challenge. In addition to what is known as "unfinished agenda" of avertable diseases affecting maternal and child health, populations are faced with a double burden of persistent and emerging infectious diseases, and increasing incidence of non-communicable diseases as risk profiles and demographic patterns shift. These problems are compounded by uneven capacity of health systems to deploy and implement proven and potential new interventions.

Health systems provide the critical interface between life-saving, life-enhancing interventions and the people who need them. If health systems are weak, the power of these interventions is likewise weakened, or even lost. Health systems thus deserves the highest priority in any efforts to improve health or ensure that resources are wisely used. Health authorities worldwide are engaged in efforts to reform and adapt health systems to improve their performance in response to global economic, political, social and demographic changes, as well as increasing and changing disease burden. They are increasingly concerned with defining policies and strategies to contain growing costs of care while preserving health system's imperatives of equity and quality.

But very little has yet been done to unravel the complex factors which explain good or bad performance by individual health systems. Given equal resources, why do some succeed where others fail, or those with less resources sometimes achieve higher results than better-off systems? Why is dissatisfaction with services so widespread, even in wealthy countries offering the latest interventions? If systems need improvement, what tools exist to guide and facilitate this process, and to measure and monitor their performance and outcomes.

Health technology in its broad sense is central to this process. It equips health professionals with indispensable means to perform their functions more effectively and efficiently while, at the same time, is frequently cited as the most significant contributor to the constantly escalating healthcare costs. Health technology has become an increasingly visible policy issue, and health technology management strategies have repeatedly come under the spotlight in recent years. Furthermore, rapid technology proliferation is often far outpacing the capacity of health systems in many countries to appropriately deploy and utilize technological innovation, and thus capture its health and economic benefits.

Clear policy guidance and effective tools for handling complex policy, strategy and technology choices are necessary for country decision-makers and managers if they are to adopt efficient practices in response to health needs and people's expectations. Research must be turned into action by focusing more on the "how" rather than the "why", "where" or "what", and bridging the "know-do" gap through better knowledge management and sharing.

WHO works jointly with its multiple partners providing evidence-based policy options and practical decision-making and management tools to help its Member States with improving performance of their health systems in general, and optimizing health systems' capacity to effectively absorb transferred technology, and making technology really bear on countries' priority health problems in particular.

WHO generates evidence and builds a knowledge base on health technology diffusion dynamics, broad systemic factors affecting the appropriate introduction and use of technology innovation, and best practices in applying proactive technology management measures, and introducing and sustaining a required system change. WHO Member States are provided with a sound policy and technical advice, guidance and support in strengthening their capacity for establishing and implementing relevant national and institutional policies, strategies, management systems, organizational structures, and developing institutional and human resource base.

Methodology Session III
HEALTH CARE TECHNOLOGY ASSESSMENT

The Principles of Cost-Effectiveness Analysis and Cost-Benefit Analysis

Marion Rauner, PhD
University of Vienna, Austria

Strategic Management of health care technologies comprises early recognition of new technologies, planning, implementation, and controlling. In this workshop, we focus on the economic assessment of health care technologies as an instrument of strategic planning and controlling of prevention programs of decision makers or reengineering projects of health care providers. Cost-effectiveness analysis (CEA) and cost-benefit analysis (CBA) serve as advanced quantitative methods for this purpose. They are often embedded in optimization and simulation models. We discuss the principles of CEA and CBA by illustrating under which circumstances they are most appropriate for policy making. Generally, CEA is used to evaluate and compare health care projects, while CBA is suitable for intersectional assessment of public projects.

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- **Rauner M.S., Bajmoczy N. (2003)** How many AEDs in which region? An economic decision model for the Austrian Red Cross, *European Journal of Operational Research*, Vol. 150, No. 1, 3-18

These references can be downloaded from the internet:
http://www.univie.ac.at/bwl/itm/lehre/ws04/gesundheit_417.068_ws04.htm

Methodology Session IV
THE USE OF MONTE CARLO SIMULATION, DISCRETE EVENT SIMULATION AND SYSTEM DYNAMICS IN HEALTH SYSTEMS MODELLING

Professor Ruth Davies
Warwick Business School, Coventry, UK

The purpose of the tutorial is to provide an understanding of commonly used simulation approaches and how they may be used in hospital and health services planning. It will demonstrate some simulation software and will compare the different approaches.

Monte Carlo simulations have increased in popularity with the availability of packages such as TreeAge, which provides decision tree simulations for the purpose of cost-effectiveness analyses. The use of Monte Carlo simulations with spreadsheet "add-ons" provides a more flexible but less user-friendly approach. We will look at a simple screening simulation, see how it might be modelled and determine what the drawbacks might be.

Discrete event simulations are widely used for health service simulations. They describe the progress of individual patients with characteristics that influence the time they spend in different states and the decisions made. Commercial packages provide graphical interfaces enabling models to be developed very quickly. This approach gives a stochastic representation of the system providing a realistic representation of patient referrals and ward use. A demonstration of a Simul8 model of a hip replacement system will show how models can be developed and results produced.

In system dynamics models, patients are aggregated and are regarded as flows through a system. They accumulate in levels which may be, for example, disease states, hospital wards or waiting lists. Feedback loops help to regulate the rates of flow which determine how fast the patients progress through the system. These models are normally deterministic and have the advantage that they can provide overviews of systems, or of interacting systems, and can demonstrate how systems might respond to changes in provision or demand. Discussion will be based on a STELLA example of a hospital system.

There will be a discussion about the relative merits of the three approaches.

Methodology Session V
CONVINCING ONESELF, CONVINCING OTHERS: THE METHOD OF ARGUMENTS

Roel Schuring, PhD
University of Twente, The Netherlands

Why do we believe in a theory? Why, for example, do we believe that the earth gradually gets warmer as we use more and more fossil fuel? What was so convincing? When we have phrased a new theory, we normally want to convince other that our thoughts are valuable. How will we convince others? This leads us to introspection: what has convinced ourselves? In the workshop we will distinguish 6 types of arguments (existing theory, method, observation & experiment, logic, elegance, rhetoric) and a way to build up the argumentation of new theory. Existing theory may be analyzed using the same approach.

Methodology Session VI
HEALTH ACTION PROCESS DESIGN: THE CASE OF HOSPITAL CARE PROVIDERS

Murako Saito, PhD
Waseda University, Japan

Three major points are to be focused in designing healthcare action process.

1. Situation awareness/situated cognition in workplace: Promotion of situation awareness, keeping higher attention and recognition on what is going in workplace are important for healthcare providers to acquire higher performance and better quality satisfied by care receivers.
2. Cognitive information processing abilities: Cognitive information processing is consisted of information transmissive processing or information feedback processing, and hermeneutic/interpretive processing or information feed forward process. In particular, information interpretive process which determines a learning process play a great role in delivering an appropriate service.
3. Mood states at work: Vigorous mood at work motivates to deliver better service and higher performance. Perceived health of nursing professionals and care-providers is significantly influenced by mood state at work. Motivation process as well as volition process is important in designing healthcare action process of healthcare providers.

These points as predictors are important in assessing performance efficiency, job effectiveness and self-efficacy of workers in the participative organization structured by multi-disciplinary healthcare professionals, administrative personnel, part time manpower and some of volunteer in a complex and dynamically changing atmosphere as seen in recent hospital environment.

Most of healthcare services delivering in hospital are carried out under clinical practice guidance which is given as compliance matter. By complying with the given jobs, healthcare performance efficiency in clinical practice can be kept. But healthcare professionals in hospital have been changing their organizational environment for them to enable to promote their skills and knowledge in responding to technological progress and social changes. In order to improve quality of care, redesigning organizational environment is required in most of hospital in Japan. Models of organizational learning on the job, models of cognitive information processing, central cycle of the organization power and settings of scenario, perceived health of healthcare workers by mood state at work are introduced and discussed by using two field studies.

Student Presentation Ia

2004-2005 WHO SURVEY FOR TESTING, THE FRAMEWORK FOR LINKING HEALTH QUALITY & HEALTH TECHNOLOGY

Thomas Judd
Kaiser Permanente, USA

- A survey of at least 30 developing countries will demonstrate how quality and technology are linked at various stages of health systems development, for purpose of improved health delivery.

- These countries will include the six countries in various stages of EHTP implementation - noted by World Health Organization (WHO) Region: Kyrgyzstan & Ukraine in Europe; China in Western Pacific; and Namibia, South Africa & Mozambique in Africa. Twenty-five to thirty others will be selected to ensure distribution across WHO's 6 global regions: Africa, Europe, South-East Asia, Western Pacific, Americas, and Eastern Mediterranean; regional survey distribution may not be equal based on WHO/country priorities.

- The original intent of the survey is to focus on the subset of medical devices (and related supplies) embedded in a country's priority health condition primary, secondary, and tertiary (three)-level clinical practice guidelines (CPGs), to determine how availability, use, accuracy, and sustainability of these devices can improve health quality. EHTP can also review of impact of other HT (pharmaceuticals, facilities, human resources) on HQ.

- This survey will review how measurement of health quality has improved clinical process, service and care outcomes in these countries to test the framework ("quality index") created for linking HQ and HT. Quality index is defined and an example given in the December 2003 WHO document **"EHTP and Health System Performance Measurement: Framework for Assessing the Impact of HT on HQ"**. Survey results will allow country-to-country and regional comparison, as well as country-specific recommendations.

Methodology
Over approximately 30 weeks 3rd quarter '04 - 1st quarter '05, working under the oversight of WHO Geneva (1), Thomas Judd (2) will establish dialog with WHO Regional Offices (3), and appropriate individual country contacts (4), via arranged internet instant messaging sessions with (1)-(4) on-line. The country contact person will typically be a key health leader who reports directly to the Minister of Health (MoH). There will be two sessions per country: initial survey orientation and a 2-3 weeks later data presentation and discussion session.

- Self-reported but supported country information and WHO-collected health system performance data, e.g., re disease prevalence and infrastructure, will be combined in the following tools to assess current framework and quality index, as well as to recommend to MoHs how EHTP implementation can address demonstrated gaps:

  - **WHO EHTP Country Implementation Impact Assessment** ("after EHTP implementation" snapshot)
  - **WHO Country Health Technology Situation Analysis** ("before EHTP implementation" snapshot)
  - **WHO EHTP Gaps Analysis** (Cost comparison of health interventions: country's existing CPGs versus WHO-recommended CPGs). Devices and other health resource gaps are analyzed for potential cost/efficiency savings.)

- For the survey, the country and regional contacts will relate their current health system challenges to **three Case Studies**, noted below and provided for reading before the orientation session, detailing how EHTP implementation has helped MoHs in other developing countries' address some of their key challenges:
  1. **Accelerating Health Reform and providing infrastructure for quality improvement (QI):** After review of this case study, countries will be asked to rank-order their reform and infrastructure development priorities from a listing of several possibilities, and to provide supportive data from recommended sources.

  2. **Costing the country's key Health Interventions to determine best QI resource investment:** After review of this case study, countries will provide 4-5 priority health conditions, supportive epidemiological data, and current three-level CPGs. Thomas Judd will conduct health resource gaps analysis using EHTP.

  3. **Using Performance Data to Change Clinical Practice to evidence-based medicine (EBM):** After review of this case study, countries will be asked to provide priority health condition data and current delivery practice information. Thomas Judd will use EHTP, the tools noted above, and a review of international best practices to recommend to MoHs how to change these practices to EBM to improve HQ.

Issue: Is there need for WHO or UCT Institutional Review Board (IRB) or Human Subjects Committee survey approval? This research will not use patient-specific but only aggregate clinical data; an exemption is expected.

Student Presentation Ib

ESTABLISHMENT OF MANAGEMENT SYSTEMS FOR ACHIEVING EFFECTIVE USE AND SUSTAINABILITY OF HEALTH CARE TECHNOLOGY IN DEVELOPING COUNTRIES

Roger Jean-Paul Schmitt
University of Capetown, South Africa

The research is based on the facts that a lot of efforts are done to supply functional health facilities including equipment in developing countries without structured managerial concepts. It is expected that developing countries have the capacities to handle equipment and buildings in order to support national programmes, i.e., tuberculosis, malaria, respiratory diseases etc. Although large HRD programmes are implemented by donors to support the national programmes at primary healthcare level in particular, the need for physical assets management at all levels however is frequently neglected as a necessary element to ensure successful completion of the programmes.

Based on long-term experiences in Senegal and Nepal along with short-term experiences in Sri Lanka, Laos and Serbia the thesis is expected to prove that an approach including the complete healthcare technology management cycle taking into consideration particular inter cultural elements can contribute substantially to a sustainable HCT management system in developing countries. Action research in workshops at regional and national hospitals will prove that without the complete integration of a HCT managerial system within the hospital management system, results will be unsatisfactory. Cost benefit analysis over long year periods will underline the need for integration of a holistic HCT management in all healthcare service deliveries in order to increase quality of services. Such an approach was implemented in Senegal over a period of ten years (where the student was in charge for the German government financed contribution) and results to date indicate that an appropriate HCT management system must include financial structures as well as a career system for its human resources to ensure that the subject of "maintenance" receives the necessary attention. Acknowledging that while the current system in Senegal is not always at top efficiency level pertaining to the efficient quality of equipment management, there is a sustainable system in situ because the holistic approach includes:

(1) Human resource development (in a national Training centre) along with a recognised diploma
(2) All trained technicians assigned to workshop facilities in the country including a status within the public service
(3) Budget lines assigned to maintenance for all national, regional and district hospitals
(4) Continued training offered to technicians in the field via the training centre

Discussion persists related to the inclusion of assessment of equipment/facilities, planning, procurement and equipment management as part of the workshop facilities and their management. Additionally, heavy administrative procedures (centralised) remain obstacles to fine tuning management performance within the facilities to promote a better investment benefit. The basis of the aforementioned work was researched and documented to 1999. Since then the student experienced developing a health care technology policy in Nepal, (sanctioned only recently after its elaboration with Nepal nationals 3 years ago) and several short term experiences on the subject in various countries. Returning to Senegal now offers the opportunity to study the impact of the HCT system locally and the quality of sustainability.

Student Presentation IIa

A MARKOV MODELING OF THE CARE DELIVERY PROCESS FOR STROKE PATIENTS AFTER DISCHARGED FROM THE HOSPITAL

Beste Kucukyazici
Mcgill University, Montreal, Canada

In this study, with the data set obtained from Regie de I'assurance Maladie du Quebec, which is under the authority of the Minister of Health and Social Services, the information of 2,652 stroke patients who discharged from hospitals in 2001 and which care providers did these patients visit in the time period following the first 3 months after discharged from hospital, has been valued. The care delivery process for the stroke patients after discharged of the hospital has been modeled via utilizing this data set.

Patient flow, the progression of patients thorough a health care facility or care providers in the care delivery process, is an operational factor in the successful delivery of health care. Until now, all the studies that model patient flow considered the patient flow thorough a health care facility; not care delivery paths in the care delivery process after discharged from the hospital. In this study, a markov modeling of care delivery paths after discharged from the hospital for stroke patients is presented. The model is proposed as an effective tool for developing an understanding of the process experienced by stroke patients discharged from the hospital to home, for producing an input to asses the care delivery process and for investigating the potential of integration to improve the process.

In the model, the states are defined as the care providers that the patients visit. The dependence of future flows upon previous care provider visited is seen in the independency test and new states with which to deal with this dependence are created. Redefined states give the model additional information for the prediction of patient movement. The model validation is made in two steps. In the first step, the predicted and empirical patient visits to each care provider resulting from successive transitions after discharged from the hospital are compared. In the second step, the total number of predicted and empirical visits made by stroke patients since their discharged from the hospital for each state is calculated and compared. In both of the two steps, the results are satisfied and it is validated that the proposed model is accurate. By using the proposed model, the number visits to each type of care provider and the expected costs are predicted.

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Student Presentation IIb

USING ANT COLONY OPTIMIZATION AND DISCRETE EVENT SIMULATION TO ANALYZE PREVENTION STRATEGIES FOR CORONARY HEART DISEASE INITIATED BY PRIVATE INSURANCE COMPANIES

Wolfgang Zeppelzauer
University of Vienna, Austria

Coronary Heart Disease (CHD) is the leading cause of death in most industrialized countries. The lifetime risk of having coronary heart disease after age 40 is 49% for men and 32% for women. Many factors increase the risk for CHD. Some of the risks are based on family history (genetics), while others are more controllable.

Risk factors include the following:

- Family history of coronary heart disease (especially before age 50).
- Male gender.
- Age (65 and greater).
- Tobacco smoking.
- High blood pressure.
- Diabetes.
- High cholesterol levels (specifically, high LDL cholesterol and low HDL cholesterol).
- Lack of physical activity or exercise.
- Obesity.
- High blood homocysteine levels.
- Menopause in women.
- Infection that causes inflammatory response in the artery wall.

Due to these risk factors, policy makers can choose among a variety of prevention strategies (http://www.nlm.nih.gov/medlineplus/ency/article/007115.htm):

- See your health care provider regularly.
- Don't smoke.
- Eat a low fat, low cholesterol diet.
- Eat well-balanced meals that include several daily servings of fruits and vegetables.
- Develop a routine exercise regimen. Short, frequent sessions of exercise are preferable to a complete sedentary lifestyle. Walking instead of driving, taking the stairs instead of the elevator, and parking far from building entrances are all measures that most people can incorporate into their busy routines.
- Keep blood pressure under control.
- Maintain weight appropriate for your frame and build.
- Inquire about what vitamin supplements may be helpful in the prevention of CHD.
- Manage stress.

In this thesis, we develop a Discrete Event Simulation (DES) that evaluates CHD prevention strategies for private health insurance companies. The DES will be based on the most accurate risk functions for CHD derived from European data. Colony ant optimization will be used to find optimal solutions (e.g., most cost-effective prevention strategies) based on the results from the DES.

Student Presentation IIIa

USING SYSTEM DYNAMICS FOR ACTOR COLLABORATION AT AN EARLY STAGE OF DESIGNING NEW HEALTH CARE ENVIRONMENTS

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Health care is a continuously changing system with multidimensional interactions around the patient. Planning for and designing new health care environments that meet the standards of both the contemporary health care paradigm and future demands are important. Effective communication and mutual understanding of the core processes become essential elements in the design process if good design results are to be attained. Because of the inherent complexity of health care, modeling and simulation tools are gaining importance for exploring, comprehending, learning and communicating ideas that are essential in the health care. Our research focuses on developing and testing concepts, variables and policy options to help strengthen this ability. We will study the impact of various factors for improving the health care environment towards patient-centred care.

In this project we use System Dynamics as an analysis tool in a design group for a new stroke unit. A comprehensive model of the care process from a patient-centred view will be developed. A first step in this process has been performed. In the model important variables for describing the care process as well as spatial variables are included. We will use a "group modelling" approach. The modelling process will be investigated in terms of if the simulation method supports the communication about and understanding of care processes.

Student Presentation IIIb

TESTING THE FOCUSED FACTORY APPROACH FOR INDICATED ELECTIVE TREATMENTS IN HOSPITAL CARE

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This research will focus on the effective organization of elective surgery in a hospital. The effects of the organization of hospital care on medical and economic outcomes have seldom been studied. However, there are signs that volume-variety effects might apply to healthcare. Flood and Scott (Flood and Scott, 1987) found that hospitals (or surgeons) who more frequently perform a certain treatment tend to have better outcomes. In a study by Bakker and Zuurbier (Bakker and Zuurbier, 2002) it was demonstrated that certain hospital work is done on a frequent basis. If this means there are groups of patients that require treatments that can be considered to be routine, we will be able to reduce lead-time, increase efficiency and improve outcomes that are related to "overall process control" by organizing the care for these groups of patients. This leads us to the question: "Does a routine-like organization of surgical processes with sufficient volume lead to advantages?" There are indications that the organization of 'routine' processes does lead to advantages in the medical and economic outcomes. A well-known example is the Shouldice Hospital (Davidow and Uttal, 1989; Heskett, 1983). The Shouldice Hospital has focused solely on the treatment of hernia patients, integrating all processes. It's focus has led to a competitive organization and a very high performance, establishing an overall recurrence rate of 1% and an infection rate below 0.05%.

This approach to adapt the design of a part of a larger organization towards the demands of a limited set of processes, is called the focused factory approach (Al-Mubarak, Khumawala, and Canel, 2003; Hayes and Wheelwright, 1984; Hill, 1989; Hill and Duke-Woolley, 1983; Skinner, 1974; Skinner, 1985). Within a focused factory, various aspects of the organizational design may be adapted towards this set, for instance, the responsibilities and management structure, the accounting structure, the planning-method, the mix and education of personnel and the physical infrastructure. The focused factory approach demonstrated in industry that the performance of operations increases when the diversity of operations that is offered is reduced (Hayes and Wheelwright, 1984). Literature and practice give substantial evidence that this approach might also work in hospital care. However, this has never been tested on the scale of an entire hospital. This project aims to test to which degree organizing hospital care (for indicated elective treatments) according to the described focused factory approach contributes to the efficiency and effectiveness of hospital care. Our research question therefore is: "Is a hospital that has organized its elective procedures by a focused organization more efficient, safe and effective than other hospitals, while maintaining its (medical) quality of the procedure?"

Skinner describes a focused organization as an (part of the) organization that focuses its attention on a limited set of products, technologies, volumes and markets (Skinner, 1985). In fact, by focusing Skinner aims to create a routine organization. Routine-organizations (Perrow, 1967) are characterized by task predictability and workflow predictability (Rossum, 1997). In order to sustain a competitive position, continuous improvement initiatives should be undertaken. Processes should be organized in such a way that we improve the predictability of the process itself (Spear and Bowen, 1999). Accordingly, we can distinguish five interventions that reflect the 'essence' of the focused factory approach and routine organization in industry to current knowledge. We now define a focused organization as an organization that uses:

1. A dedicated site for selected treatments (Skinner, 1985);
2. A fixed team composition (de Sitter, 1986);
3. Stable schedules (Crowther and Ford, 1922);
4. Standardized operational procedures (Taylor, 1916);
5. A continuous on-line performance monitor and feedback system (Imai, 1986; Ohno, 1998; Suzaki, 1987).

In this research project selection criteria are used to determine which treatments are eligible to the focused factory approach and a design method is used to design new care processes and a method to continuously improve these care processes. Performance of care processes will be evaluated through a measurement instrument. We will take ex-ante and ex-post measurements in order to evaluate the effects of the interventions on the efficiency and quality of surgical treatments of the unit studied (in this case the site of the Reinier de Graaf Groep at Voorburg). In order to filter out unintended hospital-specific effects we will compare the ex-post measurements to measurements of surgical treatments at other hospitals. We will classify the organizations of the treatments on the degree to which they have been organized using the same interventions as we introduced on our study site. As a counter-measure, we will measure the performance of parts in the remainder of the hospital that are medically related to the treatments selected for reorganizing in Voorburg. This facility is located in Delft. Ideally, the performance in Delft should not suffer from the interventions in Voorburg.

Student Presentation IVa

INTERNET-BASED MULTIPLE HOSPITAL GAME

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University of Vienna, Austria

This research project aims at developing an internet-based multiple hospital game to illustrate the economic and organizational decision making process in a hospital. This game serves as a teaching tool for both students and health care decision makers. For this task, we set up a multidisciplinary international research team consisting of two groups: 1) the information technology group for the implementation of the game (Technikum Vienna, Austria) and 2) the strategy group for the development of the logic of the game (Marion Rauner, University of Vienna, Austria; Markus Kraus, Institute for Advanced Studies Vienna, Austria; and Sigrun Schwarz, University of Applied Sciences Münster, Germany). The game simulates a region with two to six hospitals treating patients with different diseases. The hospitals compete against each other for patients and budget depending on the inpatient reimbursement system as well as on the mission and politics of the region. Hereby, we considered four types of inpatient reimbursement systems based on: 1) inpatient days, 2) Diagnosis-related Groups (DRG) with unlimited budget, 3) DRGs with limited budget, and 4) global budgets. Players can analyze different alternative actions for capacity planning as well as patient scheduling and control problems depending on different reimbursement systems. The uniqueness of our hospital game in the literature consists of the internet-based framework, the competition of hospitals within a region, and the consideration of different inpatient reimbursement systems. Figure 1 displays the structure of the simulation game.

Each hospital has up to 500 beds for which we considered four decision fields to model the internal structure of the hospital: management, nursing, radiology, and surgery . The key aspect of this game comprises the illustration of medical doctors', nurses', and x-ray assistants' behaviors on the hospital's performance. The game participants are responsible for one or more decision fields. The main aspects of the decision making process in the four fields is characterized as follows.

Management:
The players determine the percentage of DRG-creep. To obtain information on the competitive behavior of other hospitals, they can purchase spying data. Furthermore, they can make investments to increase staff satisfaction.

Nursing:
The players schedule admissions and discharges of patients using scheduling rules depending on the hospital management's objectives. They also decide about human resource planning such as hiring and firing nursing staff as well as determining nurse overtime.

Radiology:
The players define the opening hours of the radiology department. They also select scheduling rules for patients waiting of an x-ray examination. To cope with the x-ray workload, the players can purchase and close x-ray units. They are also involved in the human resource planning process by hiring and firing x-ray assistants as well as determining x-ray assistant overtime.

Surgery:
The players decide about opening hours of the operating theatre. They also choose scheduling rules for operative patients. To deal with the demand for surgeries, the players can open and close operating theatres. The players can reserve a certain operating theatre for emergency patients only. Furthermore, they can hire and fire operating teams and determine operating team overtime.

The game simulates twelve periods of 28 days, one year. The performance of the hospital is evaluated on pre-selected indicators such as quality of care, patient satisfaction, and staff satisfaction. A game host is responsible for the framework of the simulation game by deciding about the percentage of emergency patients for each hospital, the patient categories to be treated, the reimbursement system etc. The internet software offers a communication infrastructure to enable players to exchange information and to make corporate decisions within the hospital and with other hospitals.

Student Presentation IVb

HEALTHCARE EFFICACY IMPROVEMENT: CREATING VALUE FOR EMERGENCY PATIENTS WHILE MAKING OPTIMAL USE OF HEALTHCARE RESOURCES

Remco Rosmulder
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The pressure to control healthcare resources is rising. In the future, there will be relatively fewer people to finance our increasing healthcare demands. One of the countries facing this situation is the Netherlands. Healthcare in the Netherlands is a collectively funded sector. Measures the Dutch government has taken to control expenses result in a decrease of collective funding and an increase of individual funding. This is only a shift of costs. What is needed is an effort to improve efficacy, provide value for money. Studying this effort is the subject of this research.

A healthcare field where providing value can almost be assessed by the minute is emergency medicine. The research goal is as follows.

To generate knowledge about the way to create the most value for emergency patients, while making optimal use of healthcare resources, such as professional staff and treatment rooms.

Central theme in this study is value. In modern management perspective, creating value is the reason of existence for every firm. The questions to be researched fall into three groups. The first group of questions is meant to grasp the concept of value and the role resources play in this. The group contains questions based on management theory. With the second group of questions, we try to understand the value concept in the sector of emergency medicine. This group is the theoretical framework in this study. The framework is used to analyse the practice of emergency care in the third group of questions. These questions display our current performance in creating value for emergency patients. By comparing current performance to our understanding of how value is created in emergency care, we arrive at improvement knowledge. This is reflected in a final research question. The research questions are displayed below.

Group A - Grasp the concept of value and the role resources play
1. What is value? (What is value not?)
2. How is value created?
3. What is the role of resources in creating value?

Group B - Understand the concept in the field of emergency care
4. What is value in emergency care?
5. How is value created in emergency care?
6. What is the role of resources in creating value in emergency care?

Group C - Analyse emergency care using the concept
7. What is our current performance in creating value for emergency patients?
8. What is the role of healthcare resources in the current performance?

Compare the analysis to our understanding of value in emergency care
9. How do we maximise performance in creating value for emergency patients?

Answering the last question involves a discussion of the best way to deploy our healthcare resources. The answer leads to reaching the research goal. Depicted graphically, these questions relate to one another as follows (cf. Figure 1).

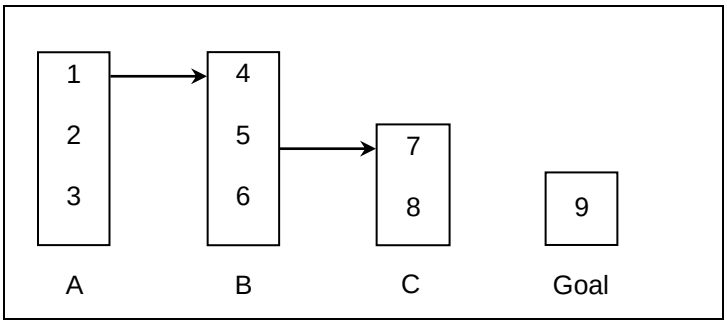

Figure 1: Relationship of the research questions and research goal

As mentioned, theoretical backgrounds of this study exist in modern management theories. These are: lean manufacturing (Womack & Jones, 1996), business process reengineering (Hammer & Champy, 1993), factory physics (Hopp & Spearman, 2000). Attention will also be paid to the role of professional identities in healthcare (Fitzgerald, 2003). There is also a strong input from the field itself. Opinions from experts in the field of emergency medicine will be integrated into the research. Attention will also be paid to improvement work of national healthcare quality improvement organisations, such as the National Health Service Modernisation Agency in the United Kingdom, the Institute of Healthcare Improvement in the United States and the Quality Institute of Healthcare (CBO) in the Netherlands.

Student Presentation Va

THE STRUCTURE OF THE INFLUENZA VACCINE SUPPLY CHAIN AND ITS IMPACT ON VACCINATION EFFICACY

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Influenza epidemics are a major economic and public health problem in many countries resulting in large numbers of deaths as well as substantial healthcare costs and lost productivity each year. In the U.S. alone, influenza results in approximately 36,000 deaths and 114,000 hospitalizations annually.

The key characteristic of the influenza virus that makes production and distribution of vaccines a major challenge is the fact that the virus continuously undergoes mutation (antigenic drift) and hence the vaccine composition has to be changed every year to make it effective. However, as a result of the long manufacturing lead-time (about 6 to 8 months), the composition of the vaccine has to be decided based on information that is outdated by the time the vaccine is available for use. A complex manufacturing process can result in unreliable supply, especially in the beginning of the season. This coupled with the uncertainty regarding the onset of epidemic leads to challenges of matching supply with demand. These challenges are further exacerbated by the economics of the vaccine supply chain, which provides inappropriate incentives to several parties in the system.

We study various aspects of the influenza vaccine supply chain, focusing on the information flow between players and the incentives of each player. We describe the structure of the system, after which we examine various potential improvements, both structural and infrastructural. We analyze the health care benefits and economic consequences of some of these improvements using a variety of models, including epidemiological models and supply-chain models.

Student Presentation Vb

EXPLORING THE EFFECTIVENESS AND EQUITY OF THE UK LIVER TRANSPLANTATION PROCESS

Suchi Patel
University of Warwick, UK

Liver transplantation is a vital medical procedure as it helps to prolong lives and improve the quality of life for a number of people suffering from liver diseases. Unfortunately though, there is a limit to the number of people that may benefit from the operation due to a shortage in the number of livers that are donated. This shortage and many conflicting viewpoints, means that it is important to make sure that the livers which are donated are not wasted and that they are used to their greatest potential. Therefore, a greater understanding of the dynamics of the liver transplantation process is required.

Many previous studies have examined the actual allocation process from the point that livers enter into the system; however, none have evaluated the criteria by which patients join the waiting list, nor have they considered future projections in supply and demand and therefore the allocation to differing patient mixes. The aims of this work are to:

- Examine how different assessment rules, allocation policies and changing demand trends impact on the overall effectiveness and fairness outcomes within the UK liver transplantation system.
- Develop a solution approach that evaluates the implications of allocating individual livers on an individual basis
- Establish a framework to assist policy makers in understanding the implications of the rules that they implement.
- Incorporate both discrete event simulation and multi criteria decision analysis.

Discrete Event Simulation will be used because it can effectively model different scenarios in a manner that would be easily understandable to policy makers. Multi Criteria Decision Analysis is appropriate for allocating the livers as it can allocate a liver to the most appropriate patient on the waiting list, at the time of donation, subject to varying criteria and weights. The outputs of both models in the form of equity (fairness) and utility (effectiveness) measures will be analysed to identify the factors that are important for consideration when allocating livers and to understand the overall dynamics of how the system operates. The information obtained will then form a basis from which policy makers can evaluate their procedures.

The model developed will consider the phases depicted in Figure 1, and provide outputs which can be compared under varying demand trends, selection rules, and allocation procedures.

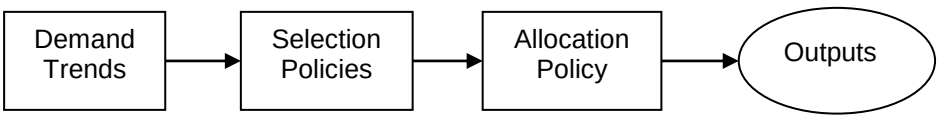

Figure 1 Three Main Phases of the Liver Transplant Model

The changes made within the demand trends phase will impact on the number of patients that enter the system. The selection policies which decide which patients join the waiting list for transplantation, and the allocation policy will decide which patient should be transplanted when a liver is donated.

The simulation model will incorporate and evaluate many policies in allocating livers. The rules will initially be based on the following:

- Current UK;
- High/Low Age First;
- Allocation Nationally/Locally;
- Allocation with & without super urgent patients;
- Varying Weight Matching;
- Identical/ABO Compatible/Any Blood Type Matches;
- Allocation based on Model for End-Stage Liver Disease (MELD) scoring system[1];
- Shortest/Any Distance from Procurement to Transplant.

The main utility measures outputted will concern the total gain in the number of life years and quality adjusted life years, under each policy evaluated. The main equity measures outputted will be waiting times and the probability of obtaining a transplant, across categories. The categories compared will be based on patient attributes, such as primary disease type, age, gender, and transplant centre. Other measures that will be evaluated in the initial model include: the number of wasted organs under each policy, and percentage of people that die in each of the states. Waiting time information across categories will be gathered and the distributions will be compared to one another using standard statistical tests, to evaluate if they are similar to each other or if one policy results in a significantly different distribution.

[1] The MELD scoring system is an index of disease severity for estimating survival in patients with chronic liver disease. The MELD allows one to make a mathematical determination of the risk of death for a given patient, based on 3 objective laboratory criteria, ultimately in order to stratify patients according to medical urgency. (Model of End-Stage Liver Disease (MELD) Scoring System for Liver Allocation: How Good Is It Really?, hbv_research archives, 2003)

Expert Panel

Due to EU data restrictions of 2018 the list have been removed.

Doctoral Students

Due to EU data restrictions of 2018 the list have been removed.