Summary

R&D stream IHS-IHU collaboration

PhD project 1: Advanced planning and scheduling for patient pathways

Context:

About Medtronic
Medtronic is a leading medical technology company employing 85 000 people in 145 countries. Recognized for its expertise in cardiac, vascular, restorative and minimally invasive and diabetes therapies, the group is evolving into a global healthcare solutions company.

Medtronic is committed to improve the lives of people through innovative medical technologies, services, and solutions. In a market that is becoming more commoditized, Medtronic is leading efforts to implement a holistic Healthcare Solution strategy. Its objective is to offer customers' clinical value from therapy innovations as well as economic value.

In this context, Medtronic is shifting its business to address this challenge. To increase value not only with devices but across the care continuum, it has created the Medtronic Integrated Health Solution℠ business (IHS). This new offering moves beyond devices to focus on system-level services and solutions.

IHS is helping hospitals, public and private payers and health systems. Its goal is to align value within the care continuum by delivering more efficient and improved care to patients through process excellence, managed services and care pathways management.

About IHU
IHU Strasbourg is a unique medical and surgical center dedicated to the management of digestive diseases. The Institute combines 3 functions:

- A healthcare center offering personalized treatment using the least invasive techniques;
- A research center gathering teams to design and develop instruments and procedures for the future;
- An international training center for professionals and students driven to learn the most advanced minimally invasive practices.

Medtronic IHS / IHU Collaboration
Medtronic IHS recently finalized a 5 year collaboration and research partnership with IHU Strasbourg to develop common expertise around patient pathway management and setting Value Base Healthcare (Patient Outcomes…) principles in IHU Strasbourg's DNA.

This collaboration agreement is structured in 4 work packages, each work package include some specific R&D projects. This PhD position will support one of these projects.

Beyond PhD funding, Medtronic's contribution to this partnership relies on a strong organization:

- Building up a dedicated team at IHU Strasbourg that will be in charge to test and translate organizational innovation into IHU daily operations.
- R&D project drive and guidance
- Support from relevant capabilities and expertise from Medtronic.

- Setting up an IT healthcare platform (patient registry, pathway management, patient relationship management)

The PhD Student will have to collaborate and leverage this organization in his daily interaction.

Summary of project: Complex care pathways require several outpatient clinic consultations, laboratory tests, imaging, assessment, multidisciplinary meetings, hospitalization, and post-operative follow-up. Complex care processes may be spread over many "episodes of care" and involve as many patient's trips to the care center. Each step is generally a function of the previous step and therefore programmed as a result of the latter, which entails a period, in days or even weeks, between each pathway' step. This delay may be detrimental to the proper patient care, particularly in the context of cancer. The articulation of different episodes of care is not always the objective, nor is working according to protocols and an accurate evaluation of the care process. A possible solution is to gather as much care episodes in one day for each patient to accelerate critical medical decisions, propose in a timely surgical treatment - if necessary, and limit travel and simplify patient procedures.

In addition to that complexity, key resources on the patient pathway like OR or diagnostic imaging face complex demand patterns (variability in demand, elective vs. non elective cases) that must be addressed through a robust session management system to match access expectation from all the healthcare professionals and the patient alike. To date, a few mathematical models have been developed to determine optimal patient routing in care pathways. The deployment of these models in practice is limited; this is due to the complexity of the models, the absence of corresponding software programs which can be used in a day to day hospital setting and limited generic applicability of the models. Furthermore, despite the mathematical complexity, most models are not able to fully entail all characteristics of the planning & scheduling process at the hospital. On an operational level, dynamic allocation of patients to appointment slots is carried out in a few hospitals, using systems which are usually placed in the waiting room. However, the intelligence behind those systems is limited, leaving a vast room for improvement.

In this PhD project we aim to develop a systematic approach to optimize a patient's journey, taking into account a large number of constraints and optimal usage of institution resources. We incorporate the diagnostic phase (special emphasis on one-stop-shop concepts to shorten patient LOS in care trajectory and reduce hospital visits), surgical episode and follow up phase. The project involves tactical and operational levels of planning & scheduling; on a tactical level a mathematical model will be developed to allocate capacity to patient groups and determine optimal patient routing (planning). On operational level day to day clinic operations will be optimized using dynamic patient scheduling. Techniques from Surgical Process Modeling will be used and expanded to analyze and optimize patient pathway patterns.

The research will be a joint collaboration between IHU, Integrated Health Solutions, Medtronic, the Center for Healthcare Operations Improvement and Research, University of Twente, and the Faculté de Médecine, Université de Rennes 1, INSERM. The location of the PhD student is flexible, however it is required for the student to spend a significant amount of time in Strasbourg and also to visit the research institutions in Rennes and Twente regularly. Daily supervision will be carried out by dr. Zonderland (IHS/CHOIR), supported by prof. Jannin (Univ. of Rennes), dr. Forestier (Univ. of Haute-Alsace) and prof. Boucherie (CHOIR).