

Chapter 22

Leveraging Key Aspects of Collaborative Techniques to Assist Clinical Decisions

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ABSTRACT

Employing collaborative systems in healthcare contexts is an important approach towards designing and developing intelligent computer solutions. The objective of this study is to develop a real-time collaborative system using the Intelligent Risk Detection Model (IRD) to improve decision efficiency for the care of patients undergoing hip and knee arthroplasty (THA, TKA). Expected benefits include increasing awareness, supporting communication, improving decision making processes and also improving information sharing between surgeons, patients, families and consultants as key collaborative parties. The research question under investigation is: How can key information technologies be designed, developed and adopted to support clinical decision making in the context of THA and TKA? This research in progress has identified the value and benefit of developing a systematic and technology supported tool to facilitate the identification of various risks associated with THA and TKA.

INTRODUCTION

Leading healthcare organizations are recognizing the need to incorporate the power of a decision efficiency approach, driven by intelligent solutions (Wickramasinghe, Bali, Gibbons, Choi, & Schaffer, 2008). The primary drivers for this include the time pressures faced by healthcare professionals coupled

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with the need to process voluminous and growing amounts of disparate data and information in shorter and shorter time frames and yet make accurate and suitable treatment decisions which have a critical impact on successful healthcare outcomes and far reaching implications for the lives of their patients (Gibbons, Bali, & Wickramasinghe, 2010; Wickramasinghe et al., 2008).

This paper directly examines the benefits of an Intelligent Risk Detection (IRD) Model (Moghimi, Wickramasinghe, & Zadeh, 2011; Moghimi, Zadeh, Schaffer, & Wickramasinghe, 2012) to support and facilitate superior decision making in the context of Hip and Knee Arthroplasty. An important, unique feature of the IRD Model is the integration of the three well established IT [information technology] solutions [Knowledge Discovery, Decision Support Systems and Risk Detection], which have proved to be very successful in providing collaborative decision support in complex, high risk decision making scenarios in various business contexts (Pulakkazhy & Balan, 2013).

The aim of this paper is to present the initial outcomes of the study conducted in one of the biggest private hospitals in Melbourne, Australia to develop and then investigate the benefits of using the IRD Model to design a collaborative system for supporting surgical decision making in the context of Hip and Knee Arthroplasty. The research question is:

How can key tools and technologies of today's information age be designed, developed, and adopted to support clinical decision making in the context of hip/knee Arthroplasty?

The four key objectives of the study include:

- **Reducing the Burden of Hip and Knee Arthroplasty:** This will be achieved by supporting the prediction of the surgery results to identify patients at risk during surgery and thereby, enabling better planning and appropriate measures to be taken in the design of an appropriate treatment protocol.
- **Improving the Treatment and Management of Hip and Knee Arthroplasty:** This will be achieved by supporting better, informed collaborative decision making which will in turn allow for more appropriate/successful treatment choices to be made.
- **Gaining an Even Better Understanding of the Consequences of Hip and Knee Arthroplasty:** This will be achieved by developing an initial repository for analysis and to discover and extract hidden knowledge (patterns and relationships) associated with surgeries and other treatments from historical data to detect important surgery risk factors which will not only lead to a better understanding of critical and potentially confounding aspects to recovery but also facilitate more tailored and appropriate treatment regimens in the specific context.
- **Developing Preventative Measures to Reduce Side Effects of Hip and Knee Arthroplasty:** This will be achieved by developing important KPIs (key performance indicators) as a set of metrics and then using these to design and develop more suitable protocols and recommendations which when applied can result in measures to reduce side effects.

To answer the research question and thereby achieve the stated aims a Design Science Research Methodology (DSRM) is adopted to design and develop a prototype of the IRD Model in the chosen research case. This paper focuses on identifying the problem and specific motivations in the case of Hip and Knee Arthroplasty and then identifying requirements towards design and develops the IRD application by using on-line survey and an expert focus group.

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