Chapter 16
Using Health 4.0 to Enable Post-Operative Wellness Monitoring:
The Case of Colorectal Surgery

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ABSTRACT

Healthcare delivery is facing multiple orthogonal challenges around escalating costs and providing quality care, especially in OECD countries. This research examines the opportunity to leverage Health 4.0 technology and techniques to address the post-operative discharge phase of the patient journey. In so doing it serves to proffer a technology enabled model that supports not only a quality care experience post discharge but also prudent management to minimize costly unplanned readmissions and thereby subscribe to a value-based care paradigm. The chosen context is stoma patients but the solution can be easily generalized to other contexts. Next steps include the conducting of clinical trials to establish proof of concept, validity, and usability.

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1. INTRODUCTION

Given the challenges facing private healthcare today and moving forward there is increasing pressure on private healthcare organizations to provide high value, high quality patient-centered care across the acute-care continuum (ACSQH 2010). While the recognition for the need of care delivery to be patient-centric is growing, the appropriateness of the approaches adopted to achieving this endeavor remain questionable (Kitson et al. 2013).

An integral enabler is without question Information Technology (IT) solutions (see for example Hibbard and Greene 2013, Wildevuur and Simonse 2015, Middleton et al. 2013). The limitation with many current systems is their limited coverage across the acute-care continuum (Collin 2015, Audet et al. 2014), where both pre-admission and post-discharge phases are not seamlessly connected to the hospitalization phase in the patient journey.

In Australia, as in other OECD countries like the US, unplanned readmissions are now being more carefully scrutinized. In most instances in Australia, unplanned readmissions are not reimbursed. i.e., readmissions within 28 days of discharge are considered to be related to the primary diagnosis/treatment, so the added cost must be borne by the provider (AIHW 2017). We believe it is possible to reduce the number of unplanned readmission by developing precision post discharge wellness monitoring solutions, and the following serves to outline this solution and answer the research question: "How can we design a suitable technology solution to support post discharge monitoring?"

We select stoma patients as a pilot study for this solution because we note that based on hospital data gathered from a large not-for-profit tertiary institute in Melbourne, Australia a common and avoidable unplanned readmission relating to stoma patients is due to inadequate hydration. This is particularly problematic during the hot dry Australian summer months.

This paper proposes a generic, open-source-based starting point for a customizable modeling, simulation and testing framework for mobile Patient Care Devices (PCDs) that can support relatively complex coordination of care for post-surgical patients. This system uses an architecture that can be modified to suit each patient's precise needs or widely differing clinical protocols. These tools allow simulation of expected ranges of safe and reliable performance and can also be used to explore or simulate likely failure modes and potential safety or health risks due to communication system or staffing overload, errors, or other complications.

2. BACKGROUND

In a recent study by the International Surgical Group on the dynamics of surgery across the globe, the findings indicated that over 320 million people globally have undergone surgical procedures; approximately 17% of these patients develop several complications and among them nearly 2.8% pass away due to these complications. It can, therefore, be estimated that approximately 1.5 million patients annually or three patients per day die due to post-operative complications. For instance, Bartels et al (2013) argue that in America, if the postoperative mortality was to be included in the official statistics as per the data from the Centers for Disease Control and Prevention, it would depict the third leading cause of death after heart illness and cancer (Bartels et al. 2015). Succinctly, many patients die in the ward or post discharge, where the doctor to patient ratio is low and where the individuals are not continuously monitored. Monitoring patients beyond the operating room and ICU may enable early detection of