Designing and Adapting Services to Create Value Outside a Hospital Using Blockchain Architecture:
Care Delivery in Patient Ecosystem

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ABSTRACT

As healthcare systems develop innovative services to create value for patients outside the hospital or clinical care facility, they face a major challenge. They need a communication architecture to support the sharing of information among the healthcare providers, patients, and external partners to fulfill the value created. The current electronic medical record systems of hospitals do not extend to many of these external partners unless they are part of the provider network. This paper proposes the use of blockchain architecture to address this challenge. By modeling service innovations used to create value as a set of service exchanges among providers, patients, and partners, the providers decide when blockchain architecture may complement their own extended EMR system in fulfilling the value they create to address patient needs. The authors use gamification to improve patient adherence to treatment plans designed to fulfill the value created and adapt the value created to reflect the changing patient ecosystem. The paper concludes with discussion and directions for future research.

KEYWORDS

Blockchain, Care Delivery, Care Transition, Incentives, Intelligent Agents, Patient Ecosystem, Public Health, Service Modeling

1. INTRODUCTION

Healthcare providers have begun to leverage advanced technology to provide innovative services to patients while they are in the hospital. These innovations include real-time locator sensors (RTLS) to track patient flows in emergency and patient rooms to reduce delays within the hospital (Stahl et al, 2014), optimally scheduled operating rooms to improve efficiencies and reduce surgical delays (Cardoen et al 2010), and improved services delivered in patient rooms such as faster responses to patient calls using technologies such as call bells, smart beds, wearables, etc. (Tanniru et al, 2018). Some of these service innovations are process focused such as multi-disciplinary rounding (Fowler et al, 2018). Many of these innovations are designed to reduce costs and improve patient satisfaction. However, with changes in reimbursement policies based on patient satisfaction and hospital readmission within 30-days after patient discharge, service innovations to coordinate cate outside a hospital have become an important focus (Medicare, 2013).

Several service innovations in support of care delivery outside a hospital were discussed in the literature (Dreyer et al, 2014). Some of these include provider interventions in the care of chronic care patients (Coleman et al, 2006), engagement of multiple external care providers in the care of patients (Naylor et al, 2004), and the engagement of community members to reduce health inequities (Jack et al, 2009). Some of these innovations are designed to address the needs of high risk population groups (Bradley et al, 2014), and others are used to support patient engagement through enhanced communication (Ghosh et al, 2014), nurse engagement in discharge planning (Kelley et al, 2013), and engagement of nurse/physician teams in addressing complex cases (Jones et al, 2013). The service innovations outside a hospital use a mix of technologies (Herzig et al, 2016, Weiner et al, 2016) including tele-health consultations and mobile apps (Koh et al, 2016). The effectiveness of service innovations is based on how closely the value created (treatment plans) matches the value fulfilled outside the hospital. Much of this value fulfillment relies on information sharing to support coordination of treatment adherence activities among patients, partners, and providers.

A service has many dimensions along which it is assessed by the customer (Parasuraman et al, 1985). Service expectations can change along any of these dimensions (some esthetic/comfort oriented and some knowledge/competency oriented) and influence perceived value as patients engage in the use of such a service. In the post-Internet era, value perceived through a service can be influenced by evolving technologies and virtualizations of patient interaction with providers and partners. How treatments developed by providers are in fact adhered to by patients is harder to assess when such a service is provided not by the hospital alone but by many other external partners. With social determinants (WHO, 2013) influencing how care related services reach the patient population, especially when they call for the engagement of non-clinical partners, the patient is further removed from the provider, thus making perceived value harder to assess.

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