

RECONFIGURABLE MODELLING WITH DEADLOCK AVOIDANCE FOR THE CLINICAL PATHWAY BASED ON MCPN-CS

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Abstract

Clinical Pathway (CP) is very complicated and has many exceptional variations. Generally, its treatment course and control steps cannot be totally predefined. Meanwhile, the CP embodies the “Re-flow” therapy features, which is very hard to model, control and manage. Therefore, combined modular modelling method and structure changing mechanisms, a Modular Coloured Petri Net with changeable structure (MCPN-CS) workflow modelling method is proposed. Aimed at the variations of the CP, the workflow model for the CP can be reconfigured dynamically by using the mechanisms of change-by-modification (CBM) and change-by-composition (CBC). A case study on a workflow modelling of osteosarcoma CP is constructed and the modelling is analyzed by proposed deadlock detection algorithms (DDA). The result validates that the proposed method may noticeably enhance the flexibility, adaptation, reusability and maintainability of the workflow model for the CP.

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Key Words: Clinical Pathway (CP), Workflow Modelling, MCPN-CS, Changeable Structure, Deadlock Detection

1. INTRODUCTION

Clinical pathway (CP) is a management plan that displays goals for patients and provides the sequence and timing of actions necessary to achieve these goals with optimal efficiency [1, 2]. After being introduced by Zander into medical care in early 1980s, it has been widely applied in hospitals and medical care communities [3, 4]. Most of references demonstrate that the CP has many advantages for the application in hospitals, like reducing medical expense, improving healthcare service quality and level, etc [5]. The CP, as a new medical management mode, has the following main characteristics: (1) It is very complex for having strong “Re-flow” features, which means that a patient may visit the same therapy phase many times in the whole treatment process; (2) Although the CP has regulated the predictable standard treatment process of certain illness, some unavoidable variations (which considered as any deviations from standardized pathway, such as infection and poisoning) still occur during the execution process usually. It is a very difficult to find a good method for dealing with the variations validly; (3) Complicated logic relations and timely constraints in different treatment activities need to be described precisely. Especially, at present, there have been a lot of reports on the CP implementations, mostly in the paper-based manual way. The predefined paper CP document only presents expected outcomes to be reached and standardized interventions to be performed across a daily timeline. Therefore, it gives rise to many problems. Workflow is the automation of a business process, in whole or part, during which

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