Supporting the assessment of clinical processes by using a structured catalogue of essential quality criteria

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Introduction Clinical processes are executed by a cooperation of highly specialised healthcare departments. Each of these departments deploys actors of different professions, has its own workflows and information systems [1-2]. The quality of clinical processes can suffer from effects of this distributed execution (e.g., redundant information objects or misunderstandings). In order to determine the quality of clinical processes and to detect possibly existing weaknesses within them, complete and systematic applicable assessment methods are needed. The assessment results can then be used to develop improvements for the actual process. After implementing these changes, the process has to be examined continuously in order to determine the degree of improvement – this way of improving processes is already established in other industries and called Business Process Reengineering (BPR, [3]). Necessary precondition for the successful application of these assessment methods are adequate models [4]. In case of clinical processes, models should describe for instance how used information objects are stored, the amount of used tools and their deployment or how several actors work together. These and further important process details are either disregarded, scattered over several independent models or included just implicitly in established process modelling methods such as UML Activity Diagrams or ARIS Event-driven Process Chains (EPC). Due to this, the MedFLow method introduced in [5] was developed. It includes all important details of clinical processes and supplies checks for the detection of possible weaknesses within those processes. A structured catalogue of these checks shall guarantee that all essential aspects of the clinical process are assessed systematically. Further a prototypic software which implements the most convenient checks shall support the assessment of large and complex process models. Aim of this abstract: This abstract shall demonstrate in short how adequately described processes can be assessed systematically considering the MedFlow method as an example.

Methods In order to adequately assess the quality of clinical processes, all important process details must be represented within the process model. Further, all quality criteria relevant for process assessment must be collected in a structured way. As a basis for modelling and assessing clinical processes the capabilities of the MedFlow method (introduced in [5]) are used. Consisting of four sub-model with each concentrating on one aspect (i.e., control flow, data flow, tool usage, organisational information) the MedFlow method describes processes including all important details. It uses established modelling methods and also introduces own elements (e.g., persistency levels). Detailed descriptions of these elements can be found under [5]

Processes are assessed by combining elements of sub-models with each other in multi-dimensional matrices. The elements are selected depending on the type of analysis which shall be performed. Each of these combinations is called a *view*. When checking for a specific flaw or weakness in the process automatically evaluable rules have to be applied. The combination of a view with a corresponding rule set is referred to as a *quality check*. Each quality check is developed to assess one specific quality criteria. Quality criteria were determined based on a systematic literature research (e.g., [ehlers]), interviews with healthcare professionals and investigations in regional hospitals. Thus, the checks are meant to assess the quality of the real-world process. Consequently, the successful application of the views strongly depends on the correctness, consistence and completeness of the model. Examples of quality criteria and there checks can be found in the result section.

Results Examples of the essential quality checks can be seen in table 1: The assessed criteria is named in the first column, the second column contains the combination of sub-models that are used to exam the quality criteria. The third column describes the rule set which has to be applied to automatically detect violation the criteria. The applicability of the criteria and checks has been evaluated by applying them on typical and fairly complex clinical processes.

	Quality Criteria	Quality Check		Possible weak point
		View	Rule Set	
1.	Number of simultaneous actions	Process Model / Organisation Model	Multiple actors per action	The process possibly gets stucked because an actor necessary for a task is busy with another task.
3.	Number of software application interfaces	Process Model / Tool Model	Multiple distinct software applications per activity	Software applications acting together in one activity have to be further examined for adequate interfaces.
4.	Media breaks	Information Model / Media Information	All information objects stored electronically and paper-based	Media cracks potentially cause inconsistencies in information objects.

Table 1: Quality criteria with corresponding views and rule sets

The quality checks were implemented in a prototypic software. This prototype is able to automatically analyse process models based on the meta-model defined in the MedFlow method. The software presents the detected weaknesses using an easily understandable web-based front-end. A more detailed description of its architecture and the used techniques can be found under [7]. Figure 1 shows an extract of a MedFlow process model where several actor are simultaneously involved in one action (i.e., "clarify ambiguity"). It is taken out of a process model which describes the ordering of radiological examinations. Figure 1 shows the part where an ambiguity in filled out documents has to be clarified involving a ward secretary and a secretary from the referring department. None of the involved actors or the used tools for communication (i.e., a telephone) must be missing – otherwise the whole process get stuck. It is important to identify these kind of tasks (further regarded as "simultaneous actions") – since they are potential bottle necks of the overall process.

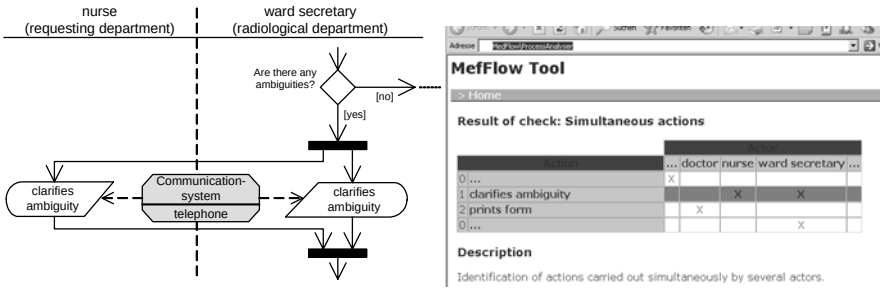

Figure 1: Example for simultaneous actions, diagram and analysis report

The quality criteria "number of simultaneous actions" can be made visible using quality criteria number 1, as described in table 1. The used view and an illustration of the applied rule set can be seen in the table on the right side of figure 1 – found matches represent simultaneous action and are highlighted.

Discussion This abstract introduces a possibility to support the assessment of clinical processes using a structured catalogue of specific quality criteria and accompanying checks. Because of its structured and methodical way this approach guarantees that all process aspects which are necessary for a complete and feasible assessment are examined. Including also descriptions which information are needed to answer the checks and how to use them

properly, the catalogue is applicable on all kinds of BPM tools. Thus, it can also be used as a catalogue of requirements which helps to improve these tools or as a guideline for the development of new assessment software. Up to now, the catalogue contains checks for crucial weaknesses of clinical processes. A first implementation of these checks uses the assessment capabilities of the MedFlow method [5]. This method allows the detection of possible weaknesses within clinical processes by combining sub-models. A prototype of an automatic assessment tool is currently being developed for a commonly used process modelling tool.However, the checks are meant to determine the quality of the real world process - not the correctness or completeness of the model itself. Thus, the successful application of the catalogue strongly depends on the correctness and completeness of the process model. In consequence, detailed checklists are needed to define which information must be considered in process models.

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