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On the Development of a Hospital-Patient Web-Based Communication Tool: A Case Study From Norway

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Abstract

Surgery cancellations are undesirable in hospital settings as they increase costs, reduce productivity and efficiency, and directly affect the patient. The problem of elective surgery cancellations in a North Norwegian University Hospital is addressed. Based on a three-step methodology conducted at the hospital, the preoperative planning process was modeled taking into consideration the narratives from different health professions. From the analysis of the generated process models, it is concluded that in order to develop a useful patient centered web-based communication tool, it is necessary to fully understand how hospitals plan and organize surgeries today. Moreover, process reengineering is required to generate a standard process that can serve as a tool for health ICT designers to define the requirements for a robust and useful system.

Keywords:

Elective surgery cancellations, pre-operative planning, web-based communication, process optimization, Norway.

Introduction

Considering the trends of healthcare, hospitals today have an extended focus on reducing costs [1]. Surgery is one of the most costly services provided by hospitals [2, 3]. However, elective surgeries are still regularly cancelled; in western countries, cancellation rates between 10 and 40 % have been reported [3-5]. Furthermore, up to 20 % of elective surgeries are cancelled on the day of surgery [6-8] and it is also identified that 50 % of these cancellations might be avoided [3, 9, 10]. Evidence [7, 11] points to lack of information as being the main cause for elective surgery cancellations, referring to information that existed but was not available when required for surgery planning. In line with what is reported in the literature, our site of research, the University Hospital of North Norway (UNN), has identified that 50 % of all cancellations are related to inadequate planning due to lack of information [12]. In the described health scenario, health ICT emerges as part of a discourse that emphasizes cost-effectiveness and active involvement of patients as a policy to meet the growing demand of care and the expected shortage of health care professionals [1].

The aim of the research project "eTeam-Surgery" is to reduce the number of elective surgery cancellations at UNN. In today's surgical process, the information required for anesthetic evaluation is gathered after the patient admission, based on a health assessment questionnaire. eTeam-Surgery will provide a digitalized tool for two way communication between the hospital and the patient prior to hospital admission. Such a tool will enable the hospital to collect the missing information from the patient at home and at an earlier stage in the pre-operative planning process.

The development of an efficient and functional web-based tool for hospital-patient collaboration is not an easy task, and it has not always been successful. As the development of health ICT grows, there are also an increasing number of reports on unsuccessful implementation projects, challenges and unforeseen consequences of ICT in health care, particularly in hospitals [13-24]. A contributing factor to such results may be found on the focus of health ICT on improving individual tasks rather than supporting value added care processes. By supporting individual tasks, ICT is focusing on the provider. This is a significant contribution to a lower quality and high cost health care. On the other hand, process focused care is centered on the patient. It integrates the teamwork (e.g. patients, physicians, nurses, caregivers, managers, and administrative personnel) to provide high quality and efficient care throughout the process. Value added care processes are the goal of the patient centered health care. However, few health care processes have been modeled comprehensively enough to provide a basis for specifying software requirements to health ICT designers. Thus, health ICT designers have focused on supporting the work of individual care team members by taking existing paper-based tools, as their models. The result is that most health ICT systems do little to support care teams. Hence, prior to development, eTeam-Surgery carried out an in-depth study of the pre-operative planning at UNN.

In this paper, is described an in-depth study of the pre-operative planning at UNN. The aim of this study was to describe and understand the process to define the requirements for a hospital-patient web-based communication tool. The paper is divided in four sections. In the first section, the health ICT limitations are introduced, and the aim of the study is described. In the second section, a brief introduction to the existing process modeling tools is presented. The methodology to model health care processes is described and explained in the third section. In the last section, discussion and conclusions, the authors elaborate on the need to understand care processes in order to define the requirements for a hospital-patient web-based communication tool.

Background

Workflow modeling is the basis for process optimization, and exists in a wide range of modeling languages. Graphical modeling languages can be divided in languages oriented to: (a) information flow, (b) control flow, or (c) objects [25]. In this work the modeling languages applied to the control flow are considered for a better accommodation of health care specific workflow.

Petri nets are a formalism of graphical modeling, with application in systems description and in the study of information processing, characterized by being asynchronous, parallel, non-deterministic and/or stochastic [26]. This formalism was applied to several problems in the healthcare field, such as the evaluation of patient monitoring systems [27, 28], the modeling of patient flows in progressive systems [29-31] or the modeling of logistic processes in hospitals [32].

Apart from the Petri nets, process chains oriented to operations, denoted Event-driven Process Chains (EPC) is another modeling formalism widely used in the healthcare field. EPC is presented as a modeling concept of logical and time dependencies of processes, and was applied to the information flow management between the different systems [33].

Materials and Methods

The eTeam-Surgery project group has developed a three-step methodology to gather the knowledge required to model the pre-operative planning process. In order to keep this paper self-contained, the empirical methodology will be described briefly hereafter, for further information please refer to [34].

1. Gather data on the hospital's representation of the elective surgery cancellation problem;
2. Observations and interviews at the hospital, related to the pre-operative planning processes at the department level;
3. Individual, in-depth interviews with all professional groups involved in pre-operative planning at a specific hospital department.

In Stage 1, the aim was to gather knowledge on UNN's understanding of the elective surgical cancellation problem, and the hospital representation of the pre-operative planning process. One document, containing information on the use of resources involved in surgery at the hospital was identified and studied [12]. In 2012, UNN initiated a Lean project in order to optimize the elective surgical process. Researchers from the eTeam-Surgery group followed this project.

In Stage 2, the pre-operative planning process at different departments at UNN was investigated. This comprised three weeks of fieldwork at the Surgery and Intensive care clinic, doing interviews while following an anesthesiologist and an anesthetic nurse. In addition, thirteen interviews with physicians, nurses and administrative personnel were conducted, at six different departments. The interviews were semi-structured, done at the workplace, and lasted between thirty minutes to two hours.

During the first two stages, two departments were described to be more efficient. However, these departments still evidenced a representative number of cancellations. One of the departments was chosen to proceed with an in-depth study in Stage 3. The chosen department is not revealed due to ethical reasons. In Stage 3, representatives from all the professional groups involved in the pre-operative planning process at UNN were addressed. At this specific department, extensive knowledge on the pre-operative planning process was collected. The department-specific interviews were semi-structured, conducted at the workplace, and lasted between one to two hours.

Results

The observations of, and interviews with, the health professionals at the chosen department at UNN, described in the previous section, allowed the definition and mapping of the generic pre-operative process model shown in Figure 1 and Figure 2. (For further information on the interviews, refer to [35].) A process model facilitates a systematic description of the events permitting the identification of each decision activity and the health worker responsible for that activity. In addition, it allows us to learn about the information flow, and allows the opportunity to identify the underlying processing issues that may be compromising the availability of vital patient assessment information.

At UNN, as seen in Figure 1 and Figure 2, the final pre-operative planning is often done after the patient has arrived for the scheduled surgery, which means, the final pre-operative planning might be completed the day prior to, or even on the day of the surgery. During this final planning process, new information, which may lead to cancellations, is gathered from the patients. Figure 1 and Figure 2 show additional steps when supplementary / new information might be necessary. The first step is in the beginning of the pre-operative planning process during the referral evaluation. A descriptive comparison of the referral evaluation process in both figures also evidences the ambiguity of the resources' role on the process. For example, as depicted in Figure 1, the task of quality assessment and subsequent referral, or request for additional information, is performed by the secretary. Figure 1 also portrays identified telephone calls between the surgeon and the patient as an additional alternative to collect lacking information. None of these tasks are described in Figure 2.

Discussion and Conclusions

As explained in the Introduction section, Health ICT orientation to individual tasks reflect the focus of health care itself: The majority of clinical departments behave as discrete and independent sets of physicians, nurses, and other health personnel instead of a single team [36]. This is partly due to the autonomy of most clinical departments.

eTeam-Surgery started by mapping and evaluating the pre-operative process at UNN, and explored a system for gathering information from a patient on his/her condition through a personal health assessment questionnaire. This process facilitated the evaluation as to whether if, and how, part of the process could be migrated from the hospital to the patient at home through electronic collaboration.

The comparison of the pre-operative planning process models, shown in Figure 1 and Figure 2, evidences the heterogeneity of work patterns at the individual level. The narratives of the different health professions describe different patient pathways for the same process. This analysis of hospital workflow evidences the superfluous work required by hospital personnel to develop and document the information required for the patient to move forward in the EHR pathway. In such an environment, it is very difficult to develop a Health ICT system that both supports the full process and is useful for each member of the care team. Therefore, we argue that in order to develop a useful patient centered web-based communication tool, it is imperative that the processes by which hospitals plan and organize surgeries are fully understood, and that process reengineering be employed in the generation of standard processes of robust Health ICT system.

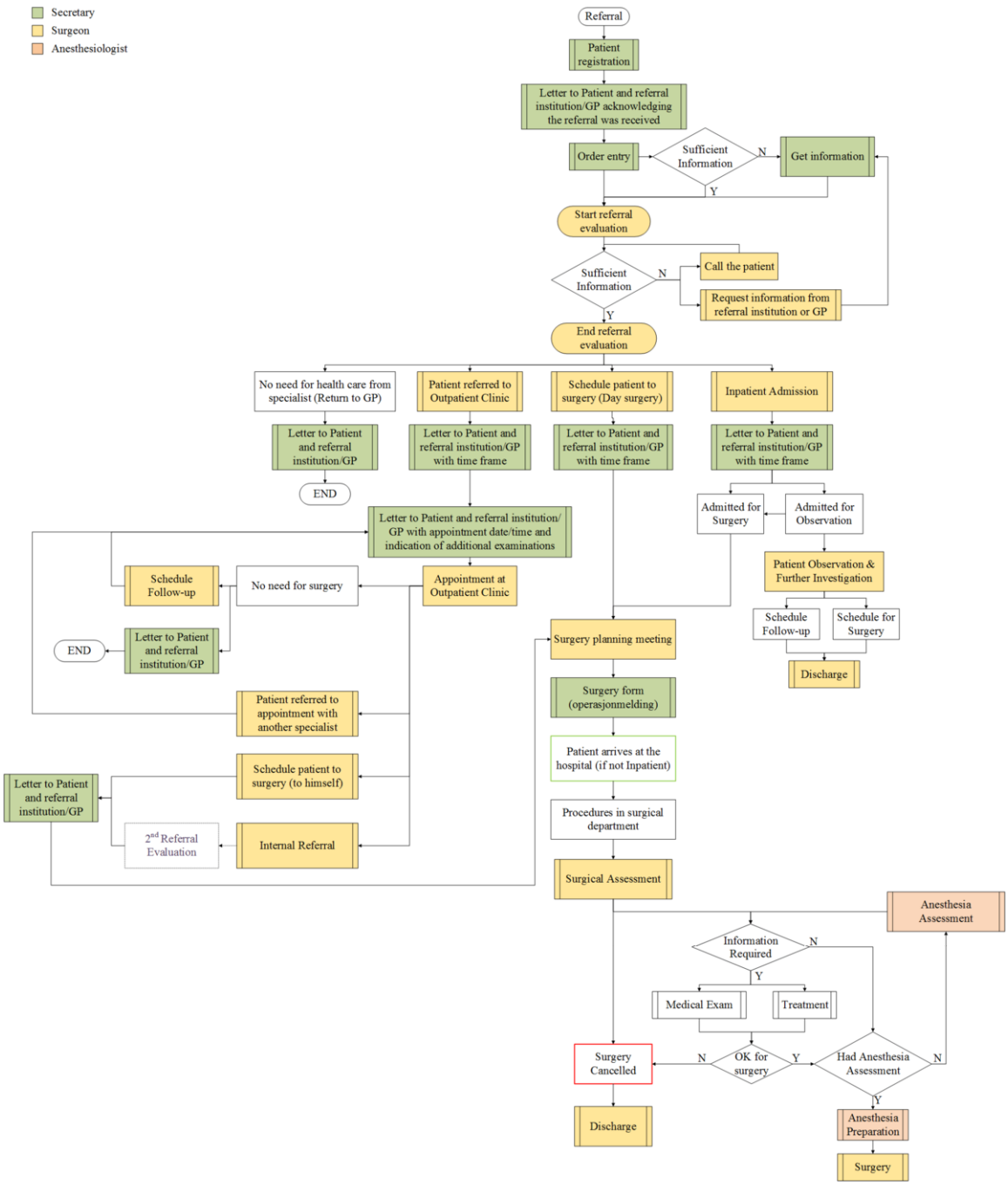

Figure 1 - Pre-operative planning process as experienced by surgeons and physicians.

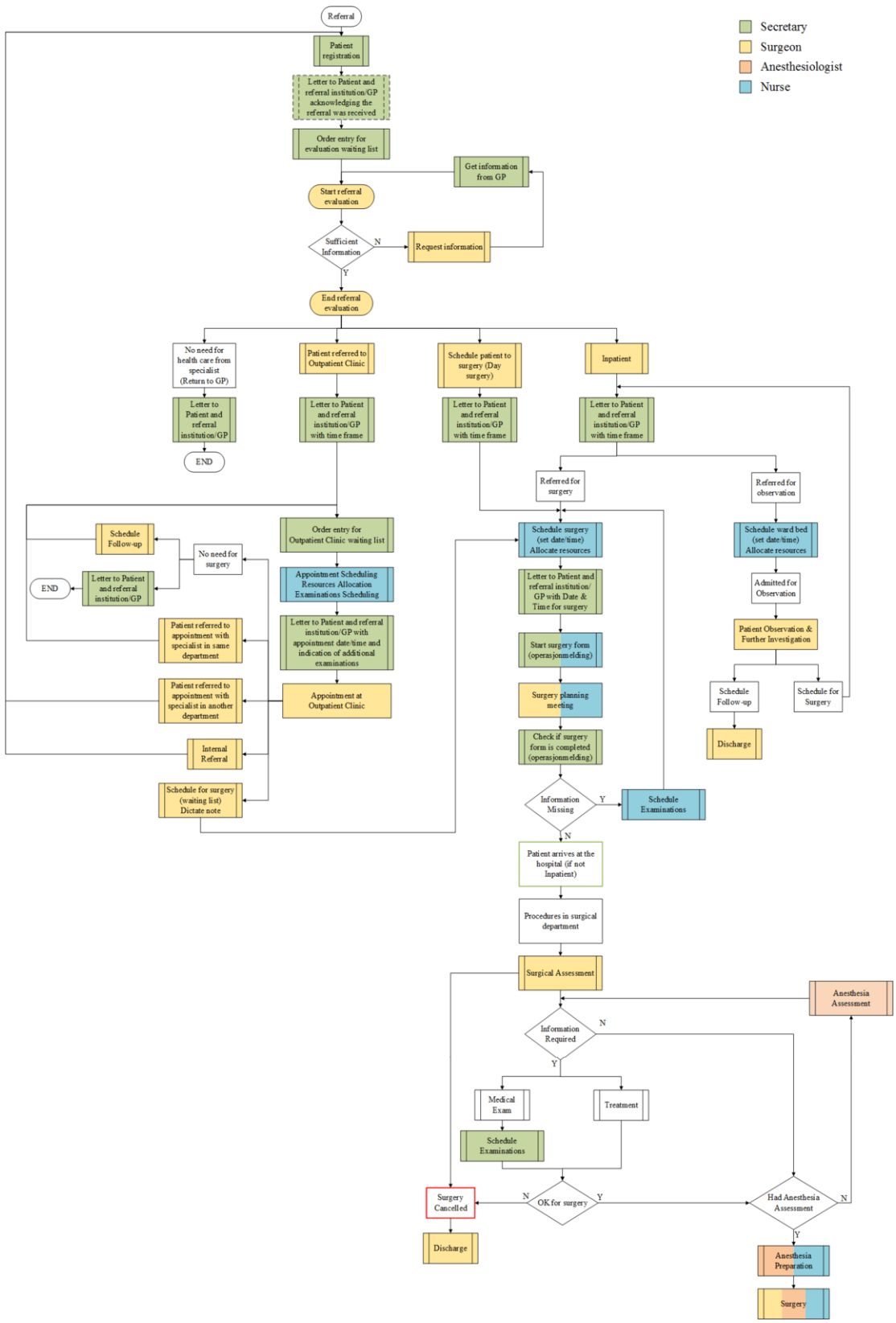

Figure 2 - Pre-operative planning process as experienced by coordinating nurse.

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