Clinical Processes in an Innovative Vascular Surgeon Community. Implications for Workflow Modeling

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Abstract: *Objective:* To identify factors influencing variations in clinical work in the care of patients with abdominal aortic aneurism. *Method:* Ethnographic observations of 26 meetings between surgeons and patients in two community hospitals and one university hospital. Observations data were abstracted into scenarios that describe the typical clinical workflow. Characterizations of features of the scenarios were performed. *Results:* When comparing the university hospital and the community hospitals we find large variations in patient trajectories, and in the relation between actors' and roles. *Conclusion:* Given a clinical domain distinguished by an unrelenting search for new and improved surgical techniques, workflow system requirements should reflect that healthcare planning not only is conducted with the purpose of providing care but also with purpose of developing new or maintaining existing surgical skills.

Keywords: workflow systems, clinical process, cardiovascular, decision-support

Introduction

Clinical practice guidelines are systematically developed statements that describe how healthcare should be enacted to comply with the principles of Evidence-based medicine (EBM). It is widely assumed that implementation of clinical practice guidelines will improve both quality and efficiency of care. Accordingly, numerous initiatives have been taken to develop and implement healthcare information systems aiming to facilitate the delivery of guideline-based care [1-4]. As part of developing requirements for such information systems, studies have applied methods for observing complex care situations to develop frameworks and concepts for characterizing the specific situations

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[5-7]. Such observations have, however, revealed that there are a number of problems with guidelines. For instance, that clinicians' practice often deviates from the actions suggested in guidelines, and these deviations are often well justified [5,8-9]. Accordingly, many healthcare workflow system implementations have failed when confronted with the complex reality at a clinical ward [4].

In this paper we present preliminary data from a study of clinical practice related to monitoring of patients with severe abdominal aortic aneurism (AAA) to identify patients eligible for surgical intervention. As of 2007, the conventional method of open surgery for AAA is about to be replaced with a more advanced endovascular method (insertion of an aortic prosthesis (EVAR)). Evaluation of AAA for inclusion to stent-graft surgery as well as the actual insertion of the prosthesis requires the coordinated action of a multidisciplinary care team consisting of both radiologists and vascular surgeons [10-13]. The EVAR method is now accepted as superior to conventional open surgery [13]. Being a novel, technically demanding and technologically more advanced method, it is mainly practiced by vascular surgeons at university hospitals. In this study, we compared work practice at one university hospital with that at two community hospitals. We present data that illustrates variations in clinical practice, analyze which factors might influence or induce variation, and briefly discuss the implications for healthcare workflow systems.

Materials and methods

Healthcare scenario: Meetings between patients and vascular surgeons at one university hospital and two community hospitals owned by Central Norway Regional Health Authority.

Study design: Ethnographic observations of encounters between patients and surgeons. The contexts for data collection were two clinical situations: a) the monitoring of AAA patients potentially eligible for vascular surgery at scheduled visits, b) the decision making process leading to a choice on which surgical technique to use.

Data collection: A semi-structured observation protocol was used for recording information, including patient demographics, actors, roles, information sources, events and decisions. Narratives describing each observation were written based on the observable data and statements from the participants. These were abstracted into scenarios describing the typical course of events for the chosen situations. Each scenario was considered as an input-output process as suggested in reference [6], and a conceptual framework was used as a starting point for identifying typical scenario features [6,7].

Ethical considerations: The study was approved by the regional committee for medical research ethics and the Norwegian social science data services. Access to the field was obtained from the physicians in charge at both the radiological ward and outpatient vascular surgery ward at all three hospitals. Patients eligible for inclusion were informed about the study by letter from a coordinator or the head physician. Only patients who signed the informed consent form were recruited. Signed informed consent was also obtained from the physicians performing the scheduled visits.

Results:

Patient demographics

26 meetings between patient and vascular surgeon were observed. These included 7 female and 19 male patients: age ranging from 57 to 94 years old. Characterizing features for the *majority* were: a) the AAA was discovered by coincidence as a secondary finding during examination of another disease, b) AAA diameter ranged from 5.0 to 6.5 cm, c) a suffering of heart- and/or lung diseases.

Characteristics of patient trajectories

As stated in the materials and methods section we recorded data like actors, roles, tasks and decisions. Based on the narratives we outlined descriptions of events in a) the principal AAA patient monitoring trajectory, and b) the decision-making trajectory. Examples of both types of events are given in Table 1. Both were characterized by the surgeon performing a risk–assessment, the use of image report as a decision basis, information to the patient related to their particular aneurism as well as how the forthcoming trajectory would transpire.

Table 1. Example of patient trajectories at the university hospital and a community hospital

Event A1: Watchful waiting: university hospital.
81-year-old-man referred for monitoring of AAA. The ultrasound report showed an aneurysm diameter of 4.7 cm. At the clinical visit, one surgeon from the vascular surgeon team assessed the patient's clinical status, performing a risk-assessment. The patient was informed about the size/growth of the aneurysm since last control as well as being advised about self-care. The surgeon considered the aneurysm to be stable with a diameter well below the treatment threshold. He informed the patient that risk of treatment was greater than the risk of no-treatment. A new consultation was scheduled within 6 months – this time with a CT exam to get an overview of the anatomic characteristics.
Event A2: Watchful waiting: community hospital.
65-year-old-man referred for monitoring of AAA. The ultrasound report showed an aneurysm diameter of 4.6 cm, a growth of 0.5 cm since the last visit which had taken place one year earlier. At the clinical visit, the vascular surgeon assessed the patient's clinical status, performing a risk-assessment. The patient was informed about the size/growth of the aneurysm since last control as well as being advised about self-care The patient wanted to be considered for EVAR treatment. The surgeon explained that the threshold limit for treatment was a diameter of 5.2-5.5 cm and that the patient was a bit too young for the EVAR option. He informed the patient that risk of treatment was greater than the risk of no-treatment. In agreement with the patient, a new consultation was scheduled combined with an ultrasound examination.
Event B1: Patient trajectory at university hospital.
67-year-old man who was referred for assessment on treatment. Before the clinical visit, a CT exam was undertaken for an evaluation of suitability for EVAR. Decision on EVAR was done in a meeting between intervention radiologists and vascular surgeons, and EVAR was recommended. At the clinical visit, one surgeon at the vascular surgeon team assessed the patient's clinical status, performing a risk-assessment. The surgeon informed about the EVAR option and discussed the option with the patient. As both actors agreed on the EVAR alternative, the next step was to schedule the patient for EVAR within 1-3 month.
Event B2: Patient trajectory at community hospital.
73-year-old man who was referred for assessment on treatment. A CT exam was performed to get an overview of the anatomic characteristics. At the clinical visit the vascular surgeon assessed the patient's clinical status performing a risk-assessment. The surgeon informed about the treatment alternatives. It was decided to proceed with an EVAR assessment. The surgeon would then make a request to the vascular surgeon in charge at the university hospital who would perform a relevance assessment and request the radiologist to assess the CT-exam from the community hospital as a decision basis for EVAR suitability.

More complex decision making trajectories at community hospitals

The principal AAA patient-monitoring trajectory was quite similar at all three hospitals. However, the decision making trajectories were different (figures 1 and 2). At the community hospitals, whenever a patient eligible for EVAR was identified, another partial information routing path was triggered. The local actor had to write a referral letter to the vascular surgeon in charge at the university hospital. If urgent, the local actor would in fact also consult the person concerned by phone. Then, the university hospital surgeon performed a relevance-assessment and requested the radiological department for judgement of suitability. In the case of EVAR, the patient responsibility would be transferred from the local actor to the vascular surgeon team at the university hospital. Thus, our findings indicated a *more complex decision making trajectory at the community level* with respect to the local actor enacting multiple roles, other actors to be involved, increased information exchange, an extra decision node as well as a change in patient stream.

Variations in the use of imaging technologies and in the practice of rules for inclusion of patients to endovascular surgery:

Looking at the practices of ordering imaging analyses, we found differences between the university hospital and the community hospitals. Surgeons at the former tended to order more CT exams as part of the screening process. Surgeons at community hospitals however preferred to measure the diameter of the aneurisms by use of ultrasound, stating the necessity of making all recordings with use of the same imaging technique. Another example of variation was the practice of the rule of a lower age limit for patients eligible for EVAR. The university hospital agreed on an informal rule of a lower age limit of 60, while the local vascular surgeons seemed not to recommend EVAR until the age of 65-70.

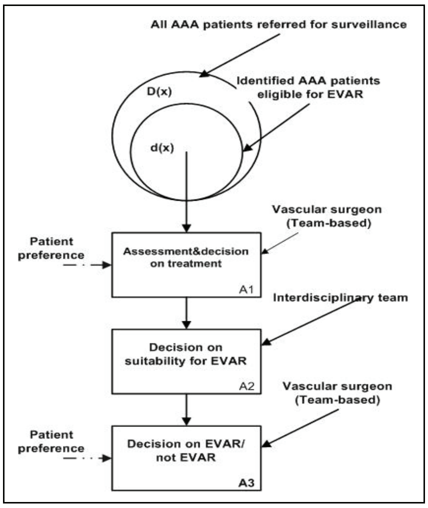

Figure 1. Patient trajectory at university hospital

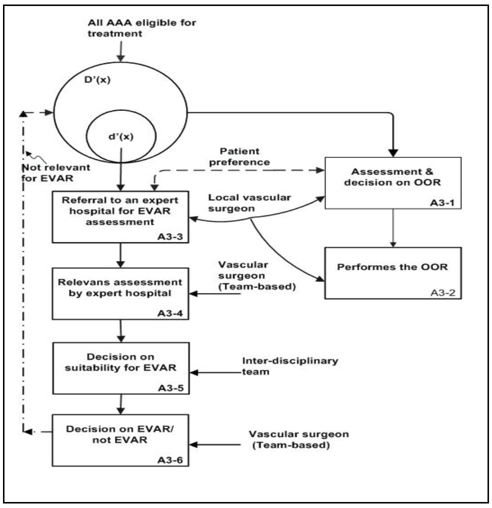

Figure 2. Patient trajectory at community hospital

Same healthcare actor - different roles

To obtain characterizing features, we used the scenarios to extract information on the involved actors and their roles. For the surgeon, two main roles were identified: the role of being a vascular surgeon and the role of scheduling and planning at the department level. As for the latter, this can be exemplified with the maintenance of patient stream related to allocating patients to the hospital and reporting to registries. Regarding the role of vascular surgeon, this encompassed a role as care provider as well as that of a person responsible for developing new or maintaining existing surgical skills. The university hospital had a team-based workflow with several surgeons. The roles were maintained either collectively or individually. In contrast, the community level was characterized by an individual aspect. The local actor kept both the role as hospital planner and that of vascular surgeon. However, the introduction of the EVAR method influenced both roles: now the local actor was assigned the task of identifying patients eligible for EVAR thus leaving a reduced number of AAA patients to be treated by the conventional surgery method. To summarize, the university level had *many actors – many roles* as opposed to the community level which had *one actor-many roles.*

Discussion:

Our findings demonstrate a more complex decision making trajectory at the community hospitals, variations in actor's role and practice behaviour. The main findings are related to the actor–role aspect. At the community level, there is only one actor enacting multiple roles: The actor is both an expert in vascular surgery and a gatekeeper responsible for recruiting patients to the community hospital. The EVAR method continuously improves, and the proportion of AAA patients eligible for EVAR is increasing accordingly. The more patients being routed to EVAR, the fewer patients are left for the conventional open surgery by the local surgeon. Personnel skills are also important for the task of identifying candidates eligible for EVAR. It is important to avoid that the EVAR alternative at one hospital can be offered to patients not being selected as eligible candidate at another hospital. In contrast, the university hospital is team-based with several actors to maintain multiple roles as a collective function.

The increased complexity in patient trajectory at community level led to a less streamlined patient flow. Throughout the trajectory, the responsibilities of the personnel changed, and actors outside the community hospital had to be engaged. Taken together, these developments challenged the organizational principle of continuity of care.

The observed variations in clinical practice because of the introduction of more advanced treatment alternatives illustrate the complexity of the clinical process. What is being produced is not only healthcare but also health personnel that master a set of skills. The illustrated variations in work practice may have implications for the architecture of healthcare workflow systems and other systems tailored to the healthcare domain. There is obviously a need to reduce inappropriate variations in healthcare practice. Because of the rapid development and introduction of improved treatment methods, such systems must be highly flexible. To be able to assign healthcare tasks to the proper actors, workflow systems must distinguish between actors that possess a particular skill and actors that not possess but are in the position to develop the particular skill. To conclude, we believe that both the production of care and the production of skills deserve the support from a workflow system.

This study has several limitations. The sample size was small and we cannot exclude the presence of research bias with regards to the observations. We could have sought to verify our findings by collecting retrospective data from the physician's medical record notes of the described events as well as from the registered procedure– and diagnosis codes in the National Patient Register. However, this method would require special approval from the National Health Authority. We currently are extending the study by using a mixed-method approach thus supplementing the empirical data with interviews of health key personnel and patients. Data from these studies will be presented in separate studies.

Conclusion

Being a domain in rapid development, we found that the introduction of new treatment method introduced more complex decision making trajectory at the community hospitals that at the university hospital. Our findings also indicated variations in actor's role and practice behaviour. This has implications for the modelling of workflow and the workflow systems.

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