

Analysis and Modeling of the Treatment Process Characterizing the Cooperation within Multi-professional Treatment Teams

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Abstract: We would like to introduce several aspects of the analysis and modeling of the treatment process characterizing the cooperation within multi-professional treatment teams. We will determine what is meant by a treatment process in order to then look at five views and four levels of their description. We will introduce possible methods for surveying and describing it. Currently an extensive analysis of the current state of the treatment process and of the weaknesses is underway in the Department of Child and Adolescent Psychiatry of the Heidelberg University Medical Center.

1 Introduction

The enormous increase in possibilities within medical and technical diagnosis and therapy have lead to an extreme specialization and task orientation within professional groups involved in the treatment process. Highly complex task-oriented organizations have also arisen in hospitals and university clinics ([1]). A result of this is the fragmentation of the treatment chain in the health care system and an increasingly large number of information interfaces between the involved professionals and institutes ([2]). For this reason, it has become difficult to see the overall picture of patient care from a medical, care-taking, and economic perspective. This, in turn, endangers the quality of patient care and causes unnecessary costs, e.g. through repeated testing due to a lack of communication.

A reaction hereto is the demand for more individual and holistic patient care. Herein, an overall patient-oriented treatment process view is taken which not only includes all of the professional groups involved, but also the tight cooperation between the various professional groups and institutions (e.g. [2]).

Before reorganization of the processes can begin, a systematic study of the current patient care processes is necessary with special attention placed on patient-oriented communication and cooperation within the treatment teams ([3]). Especially in psychiatric hospitals, a tight cooperation and communication between the various professional groups is central for ensuring individual and holistic patient care. A research project to this subject is currently underway in the Department of Child and Adolescent Psychiatry of the Heidelberg University Medical Center.

2 The treatment process

2.1 Definition of "treatment process"

At the beginning of this project it was essential to define the term "treatment process". A study of the available literature showed varying definitions and perspectives.

A "process", in general, is defined as a set of activities and their logical timely sequence ([4]). Hereby, a process has a defined beginning and end. Processes can generally be described in

different levels of abstraction. A generally formulated process can be refined by viewing and processing the individual activities as separate threads.

Consequently, in this project a "treatment process" was defined as the set of activities carried out during the treatment of a patient including their logical timely sequence. From a hospital perspective, the beginning of the treatment process is the first patient contact (e.g. making appointments, admission, etc.), whereas the end is the final patient contact (e.g. follow-up examinations, completion of the physician's letter, etc.). In projects covering various health care sectors, the beginning and end should be defined in a broader sense.

The activities of the treatment process can concern the patient and his treatment either directly or indirectly (see [5]). Several activities are directly involved in patient treatment, while others are only indirectly involved. Therefore, directly involved core activities, or core processes, and indirectly involved service activities, or service processes, can be determined. Together they define the treatment process. Some examples of typical core and service processes are:

- **core processes:** admission, treatment planning and organization, order entry (possibly including appointments and the taking of samples), service conduction, service documentation and billing, clinical documentation, communication of results, etc.
- **service processes:** creation of documents, patient record archiving and administration, diagnosis documentation, resource planning, material administration, controlling, quality management, personnel management, etc.

2.2 Views of the treatment process

A thorough and complete analysis of the actual treatment process and its weaknesses must be able to include various dimensions (see [3]). Our project differentiates between five views of the treatment process:

- a) **Roles and activity profiles** involved in the treatment process: presentation of the professionals and their roles, the hierarchies and decision structures, the activities and responsibilities.
- b) **Documentation and its tools:** representation of the documentation activities within and between the departments, as well as the information processing tools used (conventional and computer-supported), including forms.
- c) **Business processes** in form of workflow process models: presentation of the logically and timely sequence of individual activities and the information processing tools used, and also the respective responsibilities.
- d) **Communication** between professionals: representation of the communication processes taking place between the various roles, as well as the structure of meetings, briefings, postings, etc.
- e) **Cooperation** within the multi-professional treatment team: representation of how the multi-professional team is made up, role distribution within the team and the cooperation between team members.

Representation of the communication and cooperation within the team is especially important for the research project described. In this way, the state and the problems of the teamwork surrounding the core processes of the treatment process can be made visible. They are presented in an independent, explicit perspective since they are only implicitly presented in the other views.

Each of the five views can also be seen from four different levels (compare [6]):

- the overall organization (in other words, the Department of Psychiatry);
- an organizational unit (e.g. ward);
- a role (e.g. ward management);
- a task (e.g. patient admission).

By combining the five views and the four levels, 20 clearly defined areas of analysis can be examined individually and then be evaluated together.

In our opinion, together the views and levels provide a comprehensive picture of the treatment process. Of course some weaknesses will be reflected within the various views (e.g. frequently missing information during physicians' rounds will be reflected in the organizational processes perspective, as well as in the communication and cooperation perspective). Analyzing the various views individually allows for targeted representation of the various aspects using special survey and description methods.

2.3 Surveying the treatment process

Since the employees involved represent the experts, an analysis of the current state of the treatment process and its weaknesses can only be complete if self-evaluation and external evaluation are combined. Therefore, **self-evaluations** of the current problems and weaknesses of the treatment process are carried out by the employees. This takes place in form of standardized questionnaires (TAA-KH [7] and LIDO [8]) and partially standardized interviews. To avoid accidentally leaving out important aspects, we have placed special emphasis on open questions (i.e. "From your standpoint, what central problems arise in the area of").

Self-evaluations are supported by **external evaluations**. These are carried out by external experts and are primarily based on observation. They include, for example, a description of how the information is processed, the analysis of typical tasks, as well as the analysis of documents and activities. Beside this, external evaluations also include occupational psychology evaluations of activities focusing on human factors (e.g. room for decision making, variability of processes, information-related difficulties, flexibility of work design, etc.). We chose KABA as psychology evaluation method ([6]). The focus on human factors emphasizes the holistic and not only technical oriented view in our project. Nevertheless, we had to adapt KABA to the needs of a clinical environment. For example we replaced the level of the work place in KABA by an analysis of the different roles of the professionals. In addition, we expanded the KABA items, especially for the description of the organization (roles, hierarchies and decision structures).

By combining external and self-evaluations, we hope to receive a better picture of the current weaknesses of the treatment process. Both methods allow us to calculate meaningful figures for relevant areas of the treatment process (i.e. employee satisfaction, degree of workload, number of people involved, degree of variability, etc.).

2.4 Description of the treatment process

After systematically surveying the five views of the treatment process, the levels are represented and evaluated. Beside the typical methods of description (i.e., tables, lists), special descriptive methods can be used to target weaknesses. For example, redundant work routines, discontinuity of media, and unclear authorizations within the treatment process can be uncovered easily. Table 1 shows which descriptive methods have been planned for use:

Table 1: Methods intended for description of the treatment process

View of treatment process	Descriptive methods
View 1: roles and activity profiles	e.g. UML use cases ([9]), activity profiles
View 2: documentation and its tools	e.g. 3-level-model of information processing ([10]), patient-centered data models
View 3: business processes	e.g. event-driven process chains, activity diagrams ([9])
View 4: communication	e.g. speech models ([11]), action workflow models ([12])
View 5: cooperation	(still under development)

Formal descriptive methods are only used in areas in which considerable insight can be gained (e.g. complex tasks). A *complete* formal description, for example of all work-flow processes in view 3, would not be meaningful.

3 Project outlook

The overall project is scheduled to last from Oct. 1999 to Sept. 2001. Phase 1 of the project encompasses a descriptive analysis of the current state of the treatment process and its weaknesses, as described above. Following this, problematic areas, or those that appear especially relevant or urgent, will be selected for further focus within the scheduled time period. Phase 1 is scheduled for completion by the end of 2000. Exemplary events from each of the levels and central weaknesses can be presented then.

In phase 2 the desired state of the treatment process will be defined and the necessary measures of intervention determined (e.g. revision of the care plan document, reorganization of internal meetings, changes in the course of the rounds, etc.). The introduction of new procedures will take place in phase 3. A step-wise implementation will take place in cooperation with the employees. Phase 4 represents the evaluation phase. Here the positive and negative effects of the interventions will be gathered. The survey methods used in phase 1 will be repeated for this purpose. In this way the effects of our intervention can be compared directly.

4 Conclusion

We presented some theoretical background on the analysis and description of the treatment process in health care, with special attention on the communication and cooperation within multi-professional treatment teams. Five central views on four levels defining the treatment process have been determined. This structure allows analysis packages to be defined easily.

Through our broad focus we expect to receive a complete analysis of the current state of the treatment process and its weaknesses with special emphasis on multi-professional cooperation in a psychiatric department. Upon successful completion of this research project, the surveys and descriptive methods can be used in other environments (e.g. other departments or region-based information systems), focussing on multi-professional treatment team cooperation.

This will get more and more attention with regard to the rising demand for patient-centered documentation and the multi-professional electronic patient record.

5 References

- [1] G. Feuerstein, Systemintegration und Versorgungsqualität. In: System Krankenhaus: Arbeit, Technik und Patientenorientierung (Eds: Badura, B, Feuerstein, G, Schott, T). Weinheim, Juventa-Verlag. 1993. 41-67.
- [2] C. Köster, Medizinische Versorgungsketten - Ihre Wirkung als Informationsverbundsystem am Beispiel der Initiative "Gesundheitsnetzwerk Rhein-Neckar-Dreieck". In: Praxis der Informationsverarbeitung im Krankenhaus (Eds: Herrmann, G, Haas, P, Kuhn, K, Prokosch, U, Schmücker, P, Köhler, CO). Landsberg, ecomed. 1998. 25-30.
- [3] G. Vassilacopoulos, E. Paraskevopoulou, A Process Model Basis for Evolving Hospital Information Systems, *Journal of Medical Systems* 1997 21(3): 141-153.
- [4] R. Haux, A. Lagemann, P. Knaup, P. Schmücker, A. Winter, Management von Informationssystemen, Stuttgart: Teubner-Verlag. 1998.
- [5] A. Buchauer, E. Ammenwerth, R. Haux, Requirements index for information processing in hospitals. In: Tagungsband der 44. Jahrestagung der GMDS, Heidelberg. (Eds: Victor, N, Blettner, M, Edler, L, al, e). München, Urban und Vogel. 1999. 228-231.
- [6] H. Dunckel, W. Volpert, M. Zölch, U. Kreutner, C. Pleiss, K. Hennes, Kontrastive Aufgabenanalyse im Büro - Der KABA-Leitfaden, Zürich: vdf. 1993.

- [7] A. Büssing, J. Glaser, Tätigkeits- und Arbeitsanalyseverfahren für das Krankenhaus (TAA-KH). In: Handbuch psychologischer Arbeitsanalyseverfahren (Eds: Dunckel, H). Zürich, vdf. 1999. 465-494.
- [8] G. Müller. Landauer Inventar zur Diagnose des Organisationsklimas (LIDO), Universität in Landau, Fachbereich Psychologie, Landau, Sept. 1999.
- [9] J. Rumbaugh, I. Jacobson, G. Booch, The Unified Modeling Language Reference Manual, Reading, MA: Addison-Wesley. 1999.
- [10] A. Winter, R. Haux, A Three-Level Graph-Based Model for the Management of Hospital Information Systems, *Methods of Information in Medicine* 1995 34: 378-96.
- [11] N. Bricon-Souf, R. Beuscart, J.M. Renard, J.M. Geib, An asynchronous co-operative model for co-ordinating medical unit activities, *Comput-Methods-Programs-Biomed.* 1997 54(1-2): 77-83.
- [12] T. Schäl, Workflow Management Systems for Process Organisations, Berlin: Springer. 1996. 200.