

# Decision support in evaluating the impacts of mental disorders on work ability

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## Abstract

*Assessing work ability involves considering symptoms of mental disorders relevant to work activity. This paper introduces a systematic process workflow and a Clinical Decision Support System (CDSS) for the evaluation of the impacts of mental disorders on work ability. The introduced CDSS is currently in use in the South Karelia District of Social and Health Services (Eksote) in Finland. By using the CDSS, Eksote has standardized the work ability evaluation process and has ensured effective execution of the process within the organization.*

## 1. Introduction

The objective of this paper is to introduce a systematic process for evaluating the work ability of mental health care patients and to present a Clinical Decision Support System (CDSS) that enables the implementation of the process in practice. The developed CDSS provides the users with workflow management of the diagnostics process, tools for supporting the diagnostic examinations and a tool for managing patient-specific information across various diagnostics processes.

Evaluation of the work ability of mental disorder patients is an essential part of the evaluation, treatment and rehabilitation of mental disorders. Psychiatric guidelines to the valuation of the impacts of mental disorders on work ability are sparse and inconclusive. Critics across Europe have pointed out the lack of quality and transparency of disability evaluation [1]. The financial impacts of work disability caused by mental disorders are significant, and thus it is essential to have a systematic process for evaluating the work

ability of a person and to be able to determine the best treatment to restore and maintain it.

The CDSS introduced in this paper is currently in use in the South Karelia District of Social and Health Services (Eksote) in Finland. Eksote arranges secondary health care, primary health care, and care for the elderly, as well as social welfare services for its eight member municipalities. Eksote delivers patient-oriented care to approximately 130 000 citizens of South Karelia. It employs approximately 4 100 people and has a budget of 370 million euros. Eksote operates in a geographical area of over 5 600 square kilometers.

## 2. Impact of mental disorders on work ability

Epidemiologic research in community and clinical settings reveals a strong correlation between mental disorders and impaired occupational and social functioning. Primary care patients with depressive and anxiety disorders have poorer social, role, and occupational functioning than patients without these disorders. Depressive disorders have also been associated with a larger number of disability days and poorer role functioning than several common general medical diseases, including arthritis, hypertension, and diabetes. The link between specific mental disorders and functional disability may be obscured by the co-occurrence of multiple mental disorders within the same individual. [2]

Health systems will need to address the needs of the rising numbers of individuals with a range of disorders that largely cause disability but not mortality. Effective and affordable strategies to deal with this rising burden are an urgent priority for health systems in most parts of the world [3]. It is estimated that by 2030, depressive disorders will be the leading illness

causing years of full health lost in the high-income countries [4].

There is not any definitive evidence that the incidence and prevalence of mental disorders is rising in Finland. However, almost 40% of disability pensions are granted due to a major depressive disorder. The share of major depressive disorders has doubled in ten years, and the use of anti-depressive medication has increased by 500% at the same time. [5]

### 3. Evaluation of the work ability of mental health patients

Based on an extensive literature review, evaluation of the work ability of mental health care patients has not been a widely researched area. Thus, no definitive rules can be found in the psychiatric literature about how to conduct a proper work ability evaluation process for a mental health patient. There are no common descriptive definitions in psychiatric textbooks [6][7] or psychiatric literature of how work disability or “a clinically significant disturbance” is manifested in different psychiatric diseases.

Disability refers to the past, present, and future outcome of a person’s interaction with his/her physical, social, cultural and legislative environment [1]. Work disability and impairment need to be defined on the basis of how the patient functioned before the onset of the signs and symptoms with which he/she is presented for evaluation [8].

Mental health care professionals must establish a causal relation between a patient’s health condition and his/her functional and dysfunctional capacity as required by social insurance laws and social insurance physicians.

The work ability evaluation of a mental health patient is a joint, complex and challenging task to mental health professionals. The work ability evaluation is based on the patient's work and health history, objective findings in clinical examination and the relation of the findings to work ability and overall capacity in functioning (for example ICF, WAI, OFS, WHODAS 2.0) in the society. These are difficult to align because of the contradictory interests of the parties involved.

The Work Ability Index (WAI) has been used in occupational health literature in order to measure the work ability of even people with common mental health [9][10][11], but in our experience it is not applicable to our decision support in evaluating work ability in common mental disorders.

The Occupational Functioning Scale (OFS) has been suggested for evaluating the work ability of

psychiatric patients, but OFS has not been used widely in psychiatric work ability evaluations. [12]

The new DSM-5 [13] proposes to use WHODAS 2.0 (World Health Organization Disability Assessment Schedule 2.0) as a disability assessment tool instead of GAF (Global Assessment of Functioning) in the earlier version of the DSM [14].

In our experience GAF [15] is better than WHODAS 2.0, which is too indistinctive to psychiatric work ability evaluation. GAF is intended to assess the severity of psychiatric disorders, and severity is not always in direct relation to the work ability of a person with a psychiatric disorder.

In our experience the evaluation of the work ability and disability of mental health patients must deal with the following issues [16]:

- 1) Are there medical diseases which explain the decline in work and functional capacity?
- 2) Are the diseases treated properly and according to evidenced-based guidelines?
- 3) Is there enough work and functional capacity for the work which the mental disorder patient is already doing and if not, are there any possibilities to make changes in the working conditions in order to facilitate continuation of work despite the decline in work and functional capacity?
- 4) Would working or a sick leave support recovering from mental health disorders?
- 5) What is the remaining work and functional capacity and how can it be strengthened?
- 6) Which are the conditions of rehabilitation and to what extent is the recovering mental health patient able and willing to commit to rehabilitation of his/her mental disorders?

In order to answer these issues, the evaluation of the work ability of mental health patients at Eksote consists of clinical evaluations by a psychiatrist, a psychologist, psychiatric and addiction nurses, a social worker, and an occupational therapist. If the evaluation of a patient cannot be conducted in an open ward, the patient can be placed in a day-care unit or an inpatient facility of the mental health hospital at Eksote.

The work ability evaluation process confirms whether the patient is suffering from a psychiatric disorder or not and establishes the basis for making the decisions concerning the work ability of the patient, sickness certification, and treatment and rehabilitation options.

### 4. Psychiatric CDSS literature review

A clinical decision-support system (CDSS) is any computer system designed to help healthcare workers

to make clinical decisions. In a sense, any computer system that deals with clinical data or knowledge is intended to provide decision support. Information-management tools (as health-care information systems and information-retrieval systems) provide the data and knowledge needed by the clinician, but they generally do not help in applying that information to a particular decision task. Interpretation is left to the clinician, as is the decision about what information is needed to resolve the clinical problem [17]. CDSS is software that supports clinical decision-making, in which the characteristics of an individual patient are matched to a computerized clinical knowledge base, and patient-specific assessments or recommendations are then presented to the clinician and/or the patient for a decision [18].

CDSSs fall generally into two categories: those that assist healthcare workers with determining what the correct diagnosis is, and those that assist with decisions about what to do for the patient (usually what test to order, whether to treat, or what therapy plan to use) [17]. Many systems assist healthcare workers with both activities.

The advantages of CDSS include automation of the diagnosis process and objective measurements and observations of selected parameters. CDSS provides support to the decision-making process, but it does not make any actual decisions; the role of the clinical expert is fundamental in the decision making [19].

All clinical decisions are complex, but compared to other aspects of health care, psychological or mental disorders are the hardest for diagnosis and treatment as they lie in an abstract area [20]. Psychological distress and disabilities are increasingly identified among the general population [21]. When analyzing recent development, it becomes clear that the trend is to develop new methods for decision making using a computer in psychiatry and to evaluate these methods in practice [21][22].

A number of CDSSs have been developed to address problems in health care, but there are only a few clinical decision support systems for psychiatric problems [21]. Some research articles aim at providing CDSS in the fields of psychology and psychiatry (e.g. [21][23][24]).

A Brazilian university group of psychiatrists have developed a CDSS for diagnosing schizophrenia [23]. Their SADDESQ system is a tool for students to diagnose psychotic disorders. The knowledge for the CDSS was received from experts through interviews. The interviews explored the experts' diagnostic decision-making process for the diagnosis of schizophrenia.

Suhasini et al. [21] propose a method for identifying the psychiatric problems of patients using

multimodel DSS. Backpropagation neural networks, radial basis function neural network and support vector machine models were used to design the DSS. The experimental results showed that their CDSS achieved good results in identifying the psychiatric problems.

Trivedi et al. [24] present a CDSS for the treatment of a major depressive disorder using evidence-based guidelines. The introduced CDSS provides support in diagnosis, treatment follow-up and preventive care. Later the barriers of implementation of the CDSS system for depression were studied in real clinical settings [25]. The CDSS was merged with an existing electronic health record in a public mental health care system and it became a routine part of the system of care.

## 5. Challenges in the work ability evaluation process at Eksote

About 130 mental health patients have been evaluated since the work ability evaluation team was established at Eksote in November 2010. However, it has become evident that the evaluation process and the supporting tools must be improved in order to overcome the challenges the evaluation team is facing.

The first major challenge at Eksote is that the referral process to work ability evaluation is fragmented and random. The primary care physicians take care of the short-term disability associated with psychiatric disorders, and thus many psychiatric disorders are inadequately treated in primary care. The referral policy has been changed and written referrals are no longer needed. Nurses and psychologists have been arranged to work together with primary care physicians and nurses to treat mental health patients more effectively. A quick consultation by a psychiatrist is always available to primary care personnel when needed. A short message from a primary care physician is enough to begin the work ability evaluation of a mental health patient. Also an online questionnaire about mental health disorders has been developed to help align the work ability evaluation process within the organization.

The second major challenge is that the physicians are too sparse and vague in describing the anamnesis, status and functional (dis)ability, diagnostic criteria and treatment of mental disorder patients. The work history of a patient is not always adequately analyzed, and the symptoms of mental disorders relevant to work activity are not always considered thoroughly enough when assessing the work ability. Comorbid psychiatric diagnoses are usually missing. An extensive and systematic examination process must be implemented

in order to ensure that all mental health disorders are covered in work evaluation.

The third major challenge is the selection of the right treatment path for a patient. Undertreated mental health patients need to be steered and maintained adequately in effective treatment following evidence-based guidelines. A common reason for rejecting a medical report for pension is inadequate treatment options tried in mental disorders. The work ability evaluation process must guarantee that the best possible treatment is offered to the mental health patient.

The fourth major challenge is organizing a systematic follow-up procedure for treatment. The treatment and rehabilitation of a mental health patient need to be launched as soon as possible in order to avoid unnecessary delays. Up-to-date information is needed about the locations where the patient is receiving treatment, and about the level of the progress of the patient.

The final major challenge is that the different phases of treatment and rehabilitation of mental health patients need to occur without interface problems between different treatment and rehabilitation providers. Eksote must be able to change the treatment and rehabilitation options for a patient between providers flexibly while ensuring that all the necessary patient-specific information is transferred to the new provider. Process information must be available to all participants easily in order to avoid delays in the work ability evaluation process because of missing information.

Due to the multiple challenges found in the work ability evaluation process, the decision makers at Eksote have realized that a concise support system is needed to make the work ability evaluation process more efficient and effective.

## 6. Process solution for work ability evaluation

### 6.1. Overall CDSS architecture at Eksote

Eksote has utilized an agile business process management BPM process approach to the development of CDSS in the area of mental health care since 2011. The development platform is called Serena Business Manager ([www.serena.com/products/sbm](http://www.serena.com/products/sbm)), which was chosen after it had been tested in other parts of the organization. The objectives Eksote wanted to achieve through the new approach were the following: (1) effective workflow management in order to ensure that all necessary steps in the processes are taken in a timely manner, and (2) process standardization in order to unify the diagnostics processes by enforcing the use of jointly agreed diagnostic tools, question templates and logic. The first CDSS implemented in mental health care in Eksote was the process solution to support the ADHD diagnostics process [26].

Based on the positive experiences gained from the ADHD diagnostics process solution, Eksote decided to create a comprehensive CDSS architecture (Figure 1) that includes all the diagnostics tools in use, combines individual process solutions for all major mental disorders, and enables planning and management of the rehabilitation phase for each patient. Mental health care patients have often more than one disorder, and thus the decision makers at Eksote decided that it is of utmost importance to maintain an overall view on each patient, i.e. in which diagnostic processes a person is included and which diagnostic tools have been applied to the person.

The overall CDSS architecture consists of three layers:

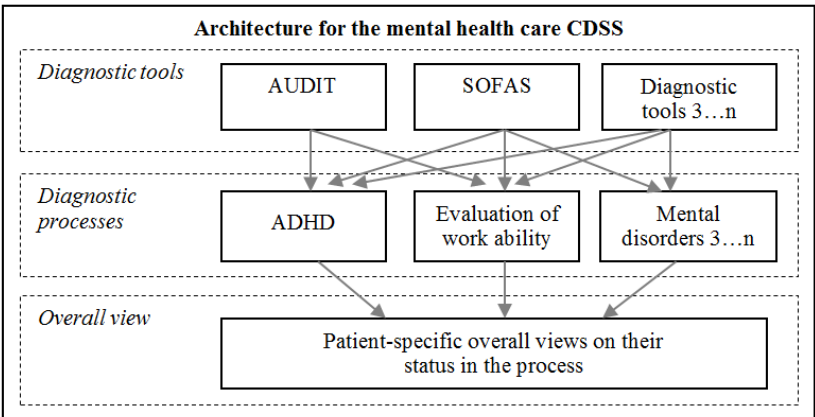


Figure 1. Overall CDSS architecture for mental health care

- 1) The layer “diagnostic tools” includes all individual diagnostics tools that are currently in use at Eksote. The reason for creating a separate layer for the diagnostic tools is that the tools are not necessarily specifically used for only one mental disorder. As the diagnostic tools are included in the CDSS as individual modules, they can be used across the various diagnostic processes in an effective way.
- 2) The layer “diagnostic processes” consists of the process solutions for the various mental disorders. The process solutions are used for managing the process workflows and for combining the right set of diagnostic tools for each mental disorder. The process workflows guide the users through the needed process steps in a strict manner. However, the users must always decide specifically which diagnostic tools are to be used for each patient. The process solution for the evaluation of work ability was the second major diagnostic process that was added to this layer.
- 3) The layer “overall view” provides the users with a tool for patient management and enables overall coordination across different processes and domains. By entering a patient’s name and/or social security number the users can see what diagnostic tools have been applied to the patient, which diagnostics processes the person has been involved in and what rehabilitation plans have been defined for the patient and how the plans are being executed. The overall view on the patient removes the former problem that a person was included in multiple diagnostic processes and the same diagnostic tools were applied within a short timeframe. The overall view gives a person-centric view on the processes and tools, showing all relevant information across all diagnostic processes. Laws and regulations permitting, the information can be shared easily with different organizational domains in order to avoid overlapping diagnostics processes.

Due to the layer-based structure, the developed CDSS can be expanded to cover all diagnostic processes used at Eksote. When a new diagnostic process workflow is added to the corresponding layer, all existing diagnostic tools are available and new specific tools can be added to the diagnostics tools –

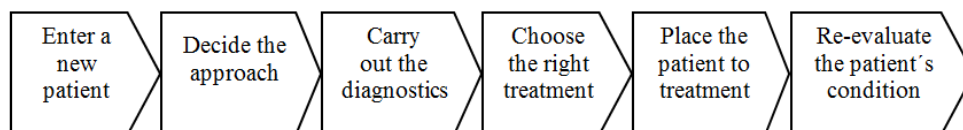
layer if needed. The new diagnostic processes and tools are then connected to the overall view –layer to enable a holistic view on the patient.

## 6.2. CDSS process workflow for the evaluation of work ability

The members of the work ability evaluation team have defined the process workflow according to the needs and requirements of Eksote (Figure 2). The development project covering both the process and the CDSS was carried out by following the principles of agile business process development. A detailed discussion on the phases of the development project can be found in [26].

One of the main objectives of Eksote is process standardization, and thus the main steps in work ability evaluation are closely related to those of the ADHD solution [26], although the actors and the actual content of the process steps are different. The new workflow consists of six main phases:

- 1) Enter a new patient: The first step in the process workflow is to enter the details of a new patient into the process solution of work ability evaluation. The information entered at this stage includes the personal details of a person, as well as an evaluation of the new patient’s initial situation by a social worker.
- 2) Decide the approach: The second main step in the process is to organize a preparatory diagnostic meeting where the initial situation of each new patient is reviewed and the decision concerning the need for various diagnostics tools is made. The participants of the preparatory meeting are the members of the work ability evaluation team: a psychiatrist, a psychologist, psychiatric and addiction nurses, a social worker and an occupational therapist. The outcome of the meeting is a task list for each team member showing which diagnostics they have to carry out for each patient.
- 3) Carry out the diagnostics: During the third step of the process workflow, the members of the work ability evaluation team carry out the defined examinations for each patient. The examinations are carried out by using the diagnostic tools available in the Eksote mental health care CDSS



**Figure 2. The process workflow for work ability evaluation**

architecture. The results of the examinations are recorded, thus giving visibility to the progress of the process.

- 4) Choose the right treatment: The fourth step of the process is the final diagnostic meeting where the decisions concerning the further treatment or rehabilitation of each patient are made. The final meeting is organized only when all defined examinations for each patient have been carried out. The process solution of work ability evaluation shows which patients are ready for the final meeting, thus eliminating the danger of having meetings organized in vain.
- 5) Place the patient to treatment: Based on the decision of the final diagnostic meeting, the patient is placed to further treatment. The type and duration of the treatment period is defined for each patient individually.
- 6) Re-evaluate the patient's condition: The condition of the patient is diagnosed on a regular basis while he/she is in treatment. The developed process solution is used for carrying out the examinations and for comparing the results to the earlier ones. Depending on the progress in the patient's condition, decisions are made concerning rehabilitation and methods for further treatment.

### 6.3. The diagnostic tools and outcome of the evaluation

There are six different actors and roles in the work ability evaluation process. All these actors use various diagnostic tools to support their evaluation of a patient's condition. These diagnostic tools are all included in the "diagnostics tools" layer of the CDSS for mental health care. None of the diagnostics tools existed in a computerized, automated form earlier, and all of them were separately programmed into the CDSS.

The main diagnostics tools used by the evaluation team in the work ability evaluation process solution are the following:

- Social worker: a specifically designed questionnaire to evaluate the level of work ability and functional abilities, SOFAS, AUDIT
- Psychiatric nurse: screening of mental disorders through an online questionnaire of previous and actual psychiatric symptoms, MDI, MADRS, MDQ, YMRS, when needed various screens of anxiety, somatoform and eating disorders, PROD, mini-PANSS and SCID II
- Psychologist: WAIS-III-IV, WMS-III and a wide range of specific neuropsychological assessment tools (the results of these methods are modified for

the solution), structured clinical interview and observation, personality inventories and projective test methods

- Addiction nurse: screening and evaluation of addiction problems and SDS, part of EuropASI and part of PRISM
- Psychiatrist: BPRS, MADRS, MDQ, YMRS, PROD and modified broadened SCID I
- Occupational therapist: AMPS, MOHOST, OSA and HOME assessment.

One of the benefits of the layer-based structure of the CDSS developed at Eksote is that some of the diagnostic tools used for work ability evaluation are the same as the ones used in the ADHD diagnostics process [26]. Thus there was no need to re-create these tools specifically for the work ability evaluation process, but it was enough to add only the needed new diagnostics tools. All the diagnostics tools follow the same basic design rules: (1) they provide the actors in the work ability evaluation process with a standardized, easy-to-use approach to the evaluation of the work and functional capacity of mental disorder patients, (2) when feasible, the questions included in the tools have a drop-down list of alternative choices for answers and (3) deductive logic has been built in where possible, meaning that the work ability process solution proposes a conclusion based on the entered information. The built-in deductive logic is based on both generally used and specific psychiatric rating scales and diagnostics criteria.

The CDSS provides the work ability evaluation team with a patient-specific summary of the results of the applied diagnostics tools. These results then form the basis for the final joint diagnostic meeting where the evaluation team makes the decision concerning the right treatment for each person. The plans for the chosen treatments are then recorded into the CDSS in order to enable monitoring and follow-up of the progress the patient makes.

In the Eksote work ability evaluation process, the patients and potential treatments for the patients are classified into four generic groups. The Eksote work ability evaluation team has defined the groups during the CDSS development project based on the work of Vuokko [16] and their own practical experience. The defined groups are the following:

- 1) Patients who need some extra capacities in order to have or maintain their working ability. They usually have not finished their formal education because of lack in certain abilities which are required in formal education. Common findings are specific learning and communicational difficulties, below than normal IQ and behavioral problems.

- 2) Patients who are recovering from an actual mental illness and are trying to return to their working places. They usually have residual symptoms of a mental disorder and are undertreated in their mental illness. When recovering from a mental illness and returning to work, they initially need to work part time in order to get their working routines back without relapsing again. They can be on a part time sick leave before returning to full-time work.
- 3) Dropouts from working life, to whom tailored extensive mental health and occupational rehabilitation efforts should be established in order to restore their work and functional ability. Many aligned psychosocial facilities need to cooperate in the rehabilitation because of multifactorial causes of work and functional disability.
- 4) Patients who are to be pensioned, who have not recovered from mental disorders in spite of exhaustive treatment and rehabilitation options, and whose work and functional incapacity is permanent. Efforts to preserve their all-day life functional capacities are taken in daycare facilities.

#### 6.4. Experiences of the developed CDSS

The first CDSS in mental health care that Eksote took into use was the ADHD diagnostics solution in early 2012. Based on the first months of utilizing the ADHD solution, the decision makers at Eksote realized that the solution developed for the ADHD process would benefit other diagnostics processes as well. Furthermore, there were clear similarities between the various diagnostics processes in terms of the process workflows and diagnostics tools used. An essential observation by the Eksote decision makers was that mental health care patients often suffer from more than one mental disorder, and thus the management of patient information across various diagnostics processes was needed.

The learning and experiences from the ADHD diagnostics solution led to the development of a comprehensive CDSS architecture for mental health care. Due to its economical significance, the process for evaluating work ability was added as the second diagnostic process to the overall CDSS. Overall, the CDSS has enabled Eksote to achieve the two main objectives it had set for mental health care processes: (1) effective workflow management and (2) standardization of the tools and approaches used within a certain diagnostics process.

The developed CDSS has proven to be an effective tool for meeting the challenges Eksote is facing in mental health care. Specifically, the developed CDSS has enabled Eksote to overcome the main challenges in the work ability evaluation process that were outlined

in section 5. The referral process is now managed more effectively, as all new patients are entered into the CDSS on the basis of the evaluation of the initial situation. The CDSS enforces the evaluation team to utilize a chosen set of diagnostic tools and evaluations, thus ensuring an extensive diagnosis. The results of the thorough diagnosis enable the evaluation team to choose the right treatment path for each patient. Furthermore, the CDSS supports follow-up of the progress the patient is making in the chosen treatment. Finally, the CDSS enables flexible exchange of information between the various actors and organizations involved in the overall work ability evaluation process.

Due to the three-layered architecture, the CDSS can be modified and expanded easily. The diagnostic process –layer currently includes the ADHD and work ability evaluation processes, but actions are already taken to add new processes, e.g. the process for preventing societal alienation of young persons. The overall view –layer helps to reduce the risk for overlapping diagnostic examinations across the various processes and enables Eksote mental health care personnel to create and maintain comprehensive rehabilitation plans for each patient.

One challenge with the developed CDSS is that the extensive diagnostics tools are quite time-consuming to fill in, and thus there has been some dissatisfaction among the users. The dissatisfaction is understandable, as earlier there were no established standards on which diagnostic tools were to be used and how the results were to be recorded. The developed CDSS enforces process discipline and establishes a standardized approach to all aspects of the diagnostics processes.

A major development action needed is creating a wider integration with the patient health record system. Import of the referrals and basic information of patients from the patient health record system to the CDSS and export of the outcome of the diagnostic tools and the decisions concerning treatment from the developed CDSS to the patient health record system are to be automated. Integration with the patient health record system will increase the effectiveness of the developed CDSS, as many time-consuming manual data entry steps will be eliminated.

#### 7. Conclusions

Early detection of impairment of work capacity, evaluation of functional capacity by a multi-professional team, and appropriate timing of treatment and rehabilitation for mental health patients are the main factors helping to prevent mental disorders and marginalization of mental health patients, which diminish the quality of their life and cause costs for the

society. Evaluation of the work ability of mental health patients is a complex process where Eksote has faced many difficult challenges. In order to improve the process, an agile business process development approach was applied to create a Clinical Decision Support system for it. The developed CDSS combines a workflow management tool with a decision support system. The solution has organized the fragmented and obscure process, aligned evaluation, treatment and rehabilitation efforts and given new incentives to develop joint efforts for the work ability evaluation of mental health patients.

Well-known risk factors for work disability are the duration and severity of prior episodes of sick leave due to mental disorders, as well as the type and severity of the disorder [27]. Our evaluation results show that acute substance abuse and alcohol problems must be treated before the evaluation process. Another issue to remember is that the evaluation of the work ability of mental health patients and the efforts to return to work should be started as soon as possible in order to avoid long-term disability.

The developed CDSS covers two diagnostic processes at the moment: the ADHD process [26] and the evaluation of work ability. The CDSS has enabled Eksote to execute these processes more efficiently and effectively, and thus the CDSS will be expanded to include the processes for preventing the social alienation of young persons, for evaluating the need for opiate dependency treatment and for polyclinic ECT-treatment of adults. The three-layered architecture of the developed CDSS provides a platform where new diagnostic processes and diagnostic tools can be added flexibly.

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