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Patterns in Treatment Methods of Depression: Outpatient Care of Depression at Jorvi and Peijas Hospitals

Technology Management and Policy

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Abstract

The objective of the study is to investigate the treatment methods of depression in public health care, and to conduct an analysis of the findings referring to a theoretical framework. A secondary objective was finding useful facts about the state of data recording, price formation, significance of outpatient care and others.

The research first investigated possible and applicable approaches and metrics. Once they were chosen, they were described. The database of choice was the Ecomed system – a software package developed by Datawell Oy for the purpose of keeping patient records at HUS. The data was extracted from the database, evaluated and an empirical analysis was conducted. The empirical data consisted of an excel worksheet containing non-personal information of patient visits, costs, dates, places and other variables.

The research showed that there are distinct patterns in treatment methodologies in terms of the duration of treatment. There are patient groups with treatment durations of 0 days, of up to 30 days, of up to 90 days, of up to 350 days, and of up to 1100 days. The mainly qualitative results show a degree of coherence with the theoretical framework. In addition, practicalfacts about price formation, frequencies of visits and others were shown (useful to the organization, not to the main aim of the study). The study paves way for progress in implementation of modernization projects at the organization.

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Introduction

The recent economic downturn has made numerous companies rethink their ways of doing things. It has revealed inefficient methods and the resulting poor performance. Although public organizations has incentives other than maximising profits and shareholder value, many of them are now looking at ways to improve their efficiency as well. The mental health treatment at the Hospital District of Helsinki and Uusimaa (Helsingin ja Uudenmaan Sairaanhoitopiiri – HUS) has been moving in the direction of quantitative analysis and improvement of efficiency for a number of years, but it is now facing increasing pressure to renew its organizational structure and the processes within. As a public organization with a strong political backing of general health coverage, it has battled the stale state of corporate culture – things are done today as they were first done decades ago. Society is evolving, the economy is pressing and the patient queues are growing. Re-engineering projects are being launched throughout HUS to face these new challenges and improve efficiency through renewed practices.

Motivation for the study

Several departments at HUS have implemented process thinking in their treatment which has helped them improve efficiency by means of motivation for shorter treatment periods, standardized procedures and simpler billing. A tool that has supported this philosophy is called the diagnosis-related group (DRG) method. In essence, the DRG system is a pricing scale for any treatment services provided. A bill is made according based on a standardized treatment package. To develop this scale, the work hours involved, the equipment and the facilities used must be considered. An average is then taken and the patient is billed accordingly. Although DRG has been successful in the somatic departments of HUS psychiatry was left out of the implementation back in the early 90's.

Now, with the new administration and the increased pressure brought about by the economic downturn the psychiatric department is looking into the system and the philosophy once more. Despite the fact that there have been studies suggesting that DRG is difficult to implement in psychiatry, the temptation of higher efficiency that the somatic department have shown is too great to overlook.

For the system to yield the desired effect of shorter treatment periods, it has to be standardized. If the required treatment is shorter than average, the standard price is still charged. If the required treatment is longer than average, it is still priced at the standard fee. This way keeping patients for too long would result in free (and probably unnecessary) treatment, which should be avoided to increase the efficiency.

This raises the question of defining the standard treatment. How important is it to commence treatment early? Who conducts the preliminary evaluation? What procedures should be conducted? What medication should be used? How frequent should the visits be? For a knee operation, the standard is simple: lab tests, an operation, a cast for several weeks, pain medication, crotches rental, physiotherapy. For a mental disorder a standard would appear to be more complex – and it truly is.

However, certain standards do exist. They are defined in the Current Care Guidelines (CCG, Käypä Hoito –suositukset). These guidelines are made by work groups of the Finnish Medical Society Duodecim, and they specify a number of treatment standards based on sound medical research (this study takes CCG as the medically correct way of treating the disorder in question). The number of options for treatment depends on the nature of the condition of the patient, and the conditions in psychiatry are often multidimensional and unique (this complexity is a chief argument against DRG in psychiatry). This study uses depression as the sample data as the treatment is somewhat standardised and uniform. Moreover, this sample is a significant portion of the total number of patient visits at HUS (approx. 25%) giving an abundance of data and making the results applicable as standalones, not just as samples of the total.

Unfortunately CCG's are merely guidelines. Despite the fact that they are made by leading professionals, they are rarely followed or enforced. In addition, they do not explicitly define the timing, the desired level of morbidity, nor the responsibility for the tasks involved. Today, it appears that every treatment procedure is assessed and altered individually by the treating personnel as it goes on. This sometimes results in patients' treatment lasting for years, which is virtually useless as suggested by the CCG.

Methodology of the study

There have been very few formal studies done in these organisations but the general attitude seems to be that the CCG's are just theoretical and are not meant to be followed. This study attempts to model the CCG's in terms of processes and hence identify the extent to which they actually are followed, and what are the implications and the possibilities of their use or the lack of it. The data used in this study is gathered from a system called Ecomed. This is a vast database of patient visits for all of HUS. Each line of data contains upwards of 170 entries including patient ID, diagnosis, date of visit type of visit, severity of symptoms and many others. The first task in the data analysis is an evaluation of the quality of the data both in terms of the structure of the system and in terms of how well it is filled out. First impressions suggest that the quality of the data is far from perfect. The second task is to draw out patterns and standards in the data. Considering the general opinion of several employees, tremendous variability in the treatment periods is expected. The extent of them is then measured and reported. The third task is to compare these findings to the ideal processes suggested by the CCG.

The analysis reveals the level of similarity between the CCG and the reality, and draws out implications of any disparity. The report includes figures of work hours and of costs involved. It is expected, that the CCG's are not thoroughly followed, but if they were, the costs and the treatment periods would be dramatically reduced which would lead to a greater turnover of patients and therefore "more mental health generated".

Implementing process thinking and DRG in psychiatry is another question altogether. First of all, the level of possible standardization in other samples might be (and apparently is) very different. This effectively eliminates the applicability of DRG in those fields (although some research suggests that process thinking can be employed even in schizophrenia – a field with enormous differences in treatment methods). Despite this, since depression is such a major part HUS, these results might assist the implementation of DRG at least in that field. Improving efficiency in a single field (especially in one as big as this one) would be a remarkable achievement.

There will also be significant political challenges in the implementation of this new philosophy. Psychiatry has traditionally been a field where human interaction and patient-doctor relationships have been considered paramount. Suggesting that treatment could and

should be standardized would likely provoke critique. The study will give the administration of HUS a considerable advantage when attempting to implement these reforms.

In addition to assisting the implementation, the study will also be a valuable contribution for any further scientific research in this grand project. Most notably, there is a possibility of extending these results into measures of the efficiency of different treatment methods. A study like this would require an analysis of mental health factors such as ability to work, number of early pensions or the ability to create personal relationships. A study like that however would require permissions from KELA (the social insurance institution of Finland) which are known to take several months to process. Given the usual depth of a master's thesis, a major study that could link processes to the efficiency of psychiatric treatment should be conducted on a separate occasion.

This paper is divided into 5 major chapters. The first chapter covers the structure and the current challenges faced by the organization. The second chapter introduces the concepts and definitions related to measuring depression and mental health care in general. The third chapters deals with the process, the challenges and the quality of the data used in the study. The fourth chapter analyzes the data and draws out some relevant conclusions. Finally, the findings and implications are summarized in the fifth chapter.

Goal of the study

The aim of this study is thus to identify patterns in treatment methods in the treatment of depression at HUS, and to assess those findings in terms of the existing guidelines. These results would lay a basis for further research that could lead to the ultimate implementation of product packaging at HUS.

A medically sound guideline for treatment does exist and it specifies an optimal treatment path for a strictly specified group of patients. Treatment past that optimum timeline, and of patient groups not requiring the specialized (and expensive) care is redundant and hence inefficient. Employees must therefore be encouraged not to keep treating the patients after this moment, but sign them out of the system. The patients – whether cured or not (but given the appropriate treatment) – are then to be transferred to another authority, namely one in primary healthcare. This requires motivation by the employees to obey the guidelines and strive for

standards. Whether motivational tools should be implemented, a baseline of the current situation must be measured.

The measures that the guidelines considered in this study define include: duration of treatment, frequency of visits, morbidity, prescribed medicine, treatment methods (therapy, medicine, ECT). Of those, the duration of treatment, the frequency of visits and possibly treatment methods can be identified in this study. The other metrics are either poorly recorded or they are contained in a different database altogether. The available figures are then to be compared with the costs (also found in the data), and correlations and patterns are to be identified. After that, a theoretical situation where the guidelines are always followed is to be defined, and the difference compared to the real situation.

As said, this is one of the first steps in a grand re-engineering project that is now to be undertaken in HUS psychiatry. Since this is a formal quantitative study, the findings of this study can then be used as justification for reforms, as hard statistics-based facts that cannot be shot down with "oh, what do you know". There are numerous other challenges that lie ahead for the management team, including implementations of new motivational tools and changing the organizational culture. This study is to assist these future solutions by giving a baseline of the current situation with solid statistical data, and thus help achieve the goal of higher efficiency.

Overview and challenges of current situation

This chapter gives an overview of the organization at hand, the problems it is facing, and hence the motivation and the necessity of this study. The overview of the situation and the challenges is based on web sites and a number of interviews conducted with several senior managers and specialists in HUS. First, the grand picture of how the organization is structured is presented. Then an overview of the major challenges is given. Finally the goals of this study are summarized considering the major problems described first.

Structure of the organization and sample

The structure of the organization has a number of levels and this subchapter gives a general overview of them. The top level is hospital districts, the next is hospital areas, then hospitals or specialties. Of the hospital levels, HUS is of interest for this study. Within HUS, the section in question is psychiatry. Further, the sample selected is care of depression in Jorvi and Peijas hospitals. Lastly, this subchapter describes the managerial set up of HUS.

Psychiatry at Hospital District of Helsinki and Uusimaa – HUS

There are two major levels of medical care Finland – primary health care and secondary health care. Primary health care is the basic treatment that can be received in general health clinics (Terveyskeskus), whereas secondary health care is given by medical staff specialized in a given field. Secondary health care is available in hospitals, clinics or university hospitals. This general division, and the organization considered in this study, can be seen below in a chart designed by P. Näätänen (Näätänen, 2010).

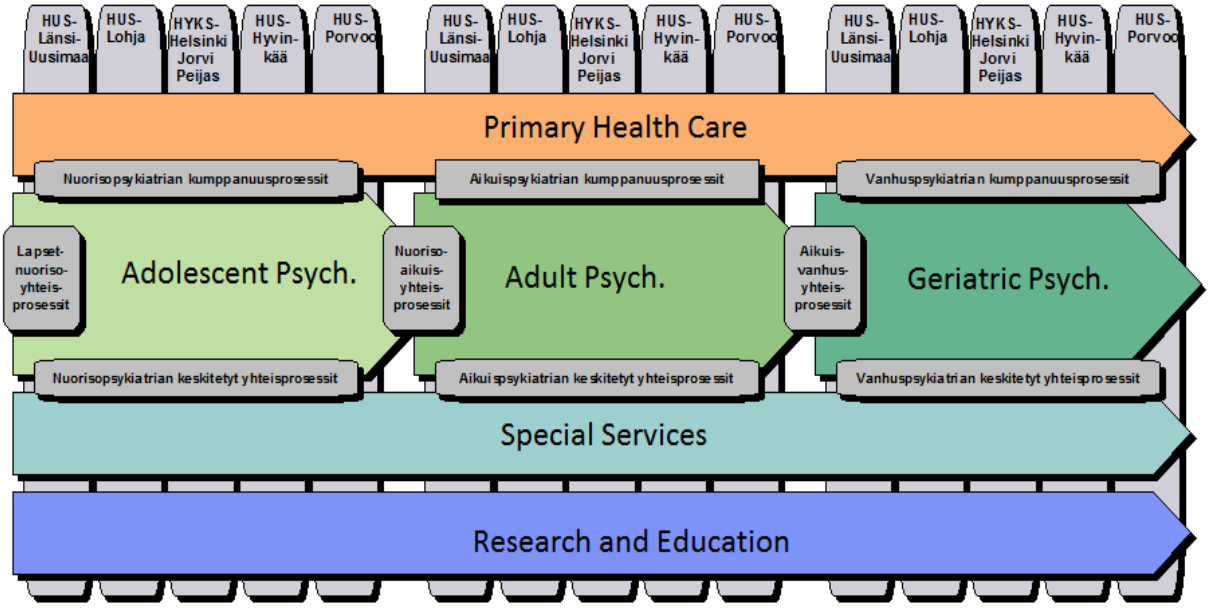

Figure 1 ***The structure of HUS psychiatry by Petri Näätänen***

The organization of secondary medical care in Finland is divided into twenty hospital districts. The Hospital district of Helsinki and Uusimaa (Helsingin ja Uudenmaan Sairaanhoitopiiri - HUS) is the largest of these [website]. It includes a total of 24 hospitals and represents 49 major medical specialties including surgery, anesthesiology, psychiatry, obstetrics and gynecology, neurology and oncology. HUS is then further divided into 5 hospital districts: Hyvinkää, Lohja, Länsi-Uusimaa, Porvoo and HUCH (Helsinki University Central Hospital). Below are some key statistics of HUS:

Hospital stays	498,592
Bed days (psychiatry, respiratory paralysis patients)	294,627
Outpatient visits	1,454,382
Surgical procedures	85,823
Deliveries	17,822
Total of different persons who used the services	445,271
Staff of HUS (31 Dec 2007)	21,202
Operating income	1,404,4 Million EUR
Operating expenses	1,320,5 Million EUR
Population of Area (31 Dec 2007)	1,476,751

Helsinki University Central Hospital – HUCH (HYKS)

HUCH is by far the largest hospital area within HUS, tending to over a million people in southern Finland. The 17 hospitals (including the major ones of Jorvi and Peijas) of HUCH are functionally divided into four main areas, called the profit units or the clinic groups: medicinal, operative, gynecology and pediatric care, and psychiatry. The medicinal unit treats allergy, skin and STD's, lung disease, neurology, cancer and internal disease. The operative unit includes surgery, anesthesiology, emergency treatment, pain treatment, ear and eye treatment, and neurosurgery. Gynecology and pediatric care consist of pediatrics, pediatric surgery, neurology, psychiatry, gynecology and child birth. Finally, the field of interest for this thesis is that of psychiatry. Its major fields are mood disorders, bipolar disorders, depression and schizophrenia. Some key figures about HUCH, which is by far the largest unit within HUS, in 2007:

Treatment periods and day surgery treatments	401,400
Outpatient visits	1,091,400
Childbirths	14,100
Number of individuals using the services	329,100

The sample: depression in Jorvi and Peijas

The sample selected for this study is depression and its treatment in the Jorvi and Peijas hospitals, that are the major sites for Espoo and Vantaa respectively. They both have a wide range of different specialty treatment but this study focuses on the psychiatric care in them. The reasons for choosing these particular hospitals were the following: the data was readily available and the hospitals are of similar status and size, making a analysis of any correlation in the results possible and interesting. The reason for choosing the treatment of depression is that, unlike other fields in psychiatry, the disorders and hence diagnosis and treatment for depression are considered to be a somewhat standardized and straight forward (unlike e.g. schizophrenia, where patients might stay in the system for years if not decades, presenting with numerous levels of severity, symptoms and undergoing various treatments). In addition, the number of patients in depression is very large, making statistical analysis of the data viable.

The challenges of the organization

The psychiatry in HUS has seen several challenges surface (or resurface) with the recent economic downturn. There is a number of essentially strategic and political challenges as well as some practical and motivational ones. The strategic and political challenges are those that need to be considered or solved in the long run, whereas the practical ones are means to that end. This section identifies these challenges and then summarizes some immediate goals that are to be strived for in order for a major reform to prevail.

Strategic and political challenges

This section goes through some major issues that HUS has to face. Some of them are problems that should be addressed, and some of them are just facts that must be accepted as given. First paragraphs mention some strategic problems. The latter ones then put across some political realities that are unlikely to change in Finland any time soon.

One of HUS psychiatry's central strategic challenges is low efficiency. There is a number of ways in which the efficiency of psychiatric treatment can be assessed (discussed in more detail further in the paper) but the general trend of public psychiatric care has been positive in the past decades. The "Mertu" –study conducted by the National Institute for Health and Welfare (Terveyden ja Hyvinvoinnin Laitos – THL) suggests that the trends aimed at higher efficiency have lead to remarkable improvement in overall mental welfare of Finland. However, challenges for these apparently beneficial reforms keep surfacing and resurfacing as they are further implemented across the country.

A major strategic challenge is closely tied to the problem of low efficiency. There have been few efforts to battle the inefficiency as the organization appears to be stale and archaic; an organization in which old habits live strong, authority is spread to every professional (and medical doctors tend to be – or at least consider themselves to be – very professional), and change is hard to justify and implement. This situation has been improving recently and psychiatry has become less institutionalized (i.e. less patients are put into inpatient care and given humane conditions to survive), less psychotherapy oriented and more process driven. Even so, the culture is far from that of a private company and hence managers attempting reforms are often faced with the age old argument: "It has always been done like so. What do you know? Who are you to challenge the late greats?" To counter this problem, the current

management is attempting a strategy of re-engineering that is based on solid statistical proof whose validity and viability could not be challenged by the above argument.

A major political challenge is the fact that HUS is a public health organization, and hence has a responsibility to the population and the management reports to the representing politicians. The actions of anyone attempting to implement changes are thus further bound by public opinion and worries about public image. It might often lead to a less than ideal decision being made for political reasons, rather than those of higher efficiency, better results or even common sense.

Another central issue stemming from the public nature of HUS is that their funds and hence bargaining power is limited. According to (Palkkatietoa, 2009), a medical doctor in the private sector earns an average of €6,400 in 2008, whereas the equivalent figure for the public sector was over a €1,000 less. The initiative of a greater salary hence does not generally apply for the public sector, whereas the stability of a job and an opportunity to gain the experience of treating a wide range of patients (the patients in the private sector are of lesser variety; generally the kind that can afford to pay for private psychiatric treatment) are certainly factors that public sector doctors appreciate. Despite this, the incentive of a high paying job proves to be stronger as can be seen by ever worsening situation of public medical staffing (MTV3, 2009). Having a smaller salary to offer its staff and being understaffed, public health organizations rarely have the luxury of haggling on working conditions with their employees and their managers' decision making power is hence further compromised.

Practical challenges

There are numerous practical challenges HUS is faced with. This subsection first mentions several typical ones and then moves to the ones that will be specifically addressed using the results of this study.

The work group composition of a standard psychiatric outpatient station (Joffe, 2010) was first set back in the 60's. Each included one doctor, one nurse and one psychologist. The reasoning behind this composition was something like this: "In psychiatric treatment there are jobs for doctors, nurses and psychologists, so let's stick some (one) of each in the mix." This issue is of major importance in terms of the efficiency of the whole system of psychiatric treatment, however it out of the scope of the current study. Attitude seen is this example has

been changing lately (and steps are being taken to adjust the balance of work force) but the fact that attitude towards strictly operational and economic issues has largely been unscientific and approximate.

Another example of this point can be made of a related subject – the division of labor in treatment processes. A doctor's hourly pay is significantly higher than that of a nurse or a social worker – this is critical to cost efficiency, yet historically often overlooked. Standardized simple procedures like checkup visits (where a standardized questionnaire is filled out to see the effectiveness of the treatment, and any side effects are recorded) do not require the expertise of a doctor – they can be easily conducted by a nurse. Also, initial assessments of the severity and the diagnostic is usually done with standardized questionnaires that can also be conducted by a nurse (in some cases like the SCID –scale, the nurse would need some extra training). There are many other examples of doctors being overqualified for the actual tasks they are doing. However, due to a lack of standard procedure guidelines and clearly defined work assignments, this significant aspect of efficiency goes largely unaddressed.

Another case where old, scientifically unjustified practices hold back the efficiency of the system is the length and the frequency of visits. According to the current perspective of (Aer, Oikkonen, & Riihimäki, 2005), outpatient psychiatric treatment has advanced significantly and have replaced many inpatient treatment methods. In addition, primary care has developed to be able to provide the treatment that was previously only available in secondary care. These include rehabilitation programs and chronic check-up visits for psychiatric patients. Outpatient care is also significantly more economical and is hence preferable in the current economic situation. Old habits tend to stick however and progress to reduce the proportion of inpatient care has been slow. When it comes to outpatient care, the Current Care Guidelines do specify, that during the treatment period, while a patient is undergoing therapy and / or anti-depressant treatment, it is necessary to let the treatment take some effect before meeting the patient again. In other words, meeting the patient every day during the treatment period would be generally useless (with certain exceptions, see "definitions" –subchapter) since the actual treatment has not had a chance to have an effect and alter the patient's condition. Thus the advised frequency of visits is once a week. But during the preliminary assessment period there is no medical reason to keep the visits so far apart, since there is nothing that needs to be allowed to take effect. There are practical reasons often referred to however, such as "We couldn't possibly force a person to miss up to three days of work." In fact, the patient would

end up spending the same amount of time at the hospital, with more time spent on the additional trips. Also, one might think that treatment of a serious mental condition could take priority in a person's life for a number of days. According to (Aer, Oikkonen, & Riihimäki, 2005), instead of spending several weeks conducting a single test per week, the assessment could be done in two or three days by simply having the patient come in on consecutive days for a few hours each. Not only would this allow a decrease of the total time a patient spends in the system (and hence any possible costs associated) , but also to diagnose the condition and begin treatment sooner. What might at first seem like a lack of regard to the matter is actually probably best explained by the fact that there is no instructions or guidelines that would specify the medically (and economically) optimal way.

Lack of regulated standards and practices is another major issue that affects the quality, the cost and hence the efficiency of treatment. There are no proper rules for the procedures that should be conducted and what order they should be conducted in (the existing guidelines are looked at in more detail below). The treatment procedures are actually determined by the doctor's experience and best judgment. One doctor might have found that a particular pair of drugs works well, and that certain kind of therapy is effective in a given situation. Another doctor might have had a different experience, would choose a different drug, a different therapy and hence a different treatment period pattern. One would hence expect a massive variance in treatment periods, and a large variance in a process is trouble. Things like the amount of mental health produced, the costs incurred, the work force required and the queue lengths are thus very difficult to estimate.

In addition, not only are the expected values above difficult to estimate, they are not consistently measured either. At the moment there is a work group at HUS psychiatry that has set out to map the processes in the treatment of psychiatry (discussed in more detail below) but it is a first of its kind and is yet to measure the actual values of the aforementioned parameters. If key values of a given treatment path were measured, an optimal method of treatment could be found. This method would then be set as a standard that employees should follow. A standard could be something like this: "Treatment with drug X for six weeks works in 60% of the cases, this should therefore be the first option of treatment. If this did not work, the next best thing is drug Y along with therapy – this is effective for the next 60% (etc.). The effect of the treatment is to be measured with GAS (a scale of severity, explained below) and results compared against benchmarks and adjusted accordingly."

The fact of poor measurement of key parameters results in several effects: the optimal treatment methods are not found and specified (although there are consensuses, discussed below), queues grow, resources are used inefficiently, and targets cannot be set. And where goals are not set, employees cannot strive for them.

Motivational challenges

Motivation is an issue for any public organization. The employees are not rewarded per unit of work done and hence they have no financial motive to exceed themselves. In the case of HUS, employees do not work for pride for a unit either, since there is no culture of team spirit in the units. One might then argue that the employees work just well enough to appear satisfactory in the eyes of peers and superiors and hence keep their jobs, and to fulfill the moral obligation of working for their money – this leaves a lot of room for improvement.

The absence of standards and target figures, along with the limited opportunity of financial incentives (thanks to the public nature of HUS) leads to the availability of few if any motivational tools. Motivating employees can be done (roughly speking)put by giving a carrot for reaching a set goal. The goal can be defined in a number of ways and the carrots could be various.

Currently, to estimate the state of a unit, the management is forced to rely on such measures as the employees' willingness or unwillingness to work there. Obviously this cannot be measured, recorded or compared – and hence rewarding performance or dealing with problematic units becomes a matter of gut feeling or word of mouth. A well functioning unit has content and motivated employees and a high efficiency – it is hard to say which is the cause and which is the effect, but the two are correlated. Efficiency is a significantly more rational metric to use than the satisfaction of the employees, when judging the state of a unit.

A possible metric that could be used to judge the state of a unit is the amount of quality treatment produced. It is difficult to define this metric, but one could perhaps use a morbidity scale such as the GAS. The following is a simple example of a quantifiable metric that could be set as a standard for an operational unit. A certain quality standard is set (e.g. a patient is healthy enough with a GAS score of X), and once it is achieved, the patient is discharged. At this stage it this is problematic however, since GAS is rarely filled in – there is no proper motivation to do so. The number of discharged patients in a given period would then show the

performance of that employee or unit. Other metrics that could be used for setting a standard to strive for are the rate of early retirements, the rate of suicides, a quality of life metric, the working ability of the patients and so on. This however is a topic best left for future research in this matter.

The well performing units are then rewarded with either nominal recognition or with financial benefits and the poorly performing units are paid attention to and taken care of. The nominal recognition could be a plaque or a diploma given out to the best performing unit every month. This would get people to take pride in the performance in their units, morale and hence efficiency would rise. That might spawn some negative opinions, but does not seem impossible. The financial benefits are more difficult. Being a public institution an performance adjusted salary would provoke an uproar of dissatisfaction since people are used to the fact that a public sector job is a stable uniform position where the state always has your back. The political aspect spoils motivation also by the way in which the budget is determined – by the costs of previous years. This means that where savings are achieved with better efficiency, they are undercut but the state's policy of budget determination. This might be corrected by putting the issue across to the politicians, arguing that it is vital for efficiency. Perhaps a compromise could then be reached where half of achieved savings will be distributed as bonuses and half will be reduced from the next year's budget.

Another problem that arises from the set salary that the employees get is that services that HUS should bill the clients (municipalities or adjacent medical organizations) sometimes go unrecorded. The most common example of this is a consultation: another hospital asks a HUS doctor for an opinion, either by phone or in writing. This service is not defines in the HUS psychiatry price list and is hence not recorded. The doctor's time is certainly spent on this activity, but the organization is not compensated for it, because there is neither opportunity nor motivation for the doctor to record this service. The management of HUS considers this to be a significant shortfall of the system resulting in a significant loss of efficiency – structures for its billing should be set up and employees should be motivated to use them.

The questions of motivation are then quite vital for the organization as a whole. However, they will be addressed by the managers of the organization at a later time, once the grounding work – including this thesis – has been done.

Theory and background

This chapter covers the theoretical aspects and definitions of concepts relevant to the thesis, as well as some examples of the techniques and tools in question have been implemented. These include information about the condition as well as its measures, definitions of some general treatment methods and finally the methods in which pricing of services is done in HUS. Each subchapter attempts to show some examples of how these concepts are presented in practice.

Quantitative approach to mental health

Mental health is historically looked upon as the more patient-doctor oriented field of medicine, whereas somatics are those that have been subject to the more process-oriented perspective. This is natural for a discipline that has relied heavily on psychotherapy, and appears to be vague and unstructured. Despite this public appearance of "softness", quantitative approaches have been employed in psychiatry for years. Studies of drug efficiency for example are reported in quantitative terms, much like procedures in somatics.

What comes to processes in mental health, a major authority in this field is Dr. Richard C. Hermann from the Tufts Medical Center in the US. He heads an institute devoted to defining, measuring and improving quality in mental health. In addition to numerous articles on the quality in mental health, Dr. Hermann was the chairman of a committee for Organization for Economic Co-operation and Development of the OECD involved in producing a report entitled "Selecting Indicators for the Quality of Mental Health Care at the Health Systems Level in OECD Countries", and wrote a book "Improving Mental Healthcare: A Guide to Measurement-Based Quality Improvement" (Hermann, 2005). The former is largely influenced by the latter.

The book is divided into two parts where the first one covers the approach, while the second summarizes the developed measures over the course of some 500 pages. While unfortunately mostly inapplicable in the current study (due to limited data, benchmarks and targets of this study), the work of Dr. Hermann is an excellent example of the quantitative approach to mental health processes and structures.

The variables are first classified into "Structural", "Process" and "Outcome" measures. These include "Clinician characteristics", "Facility characteristics", "Financing characteristics"; "Interpersonal processes", "Technical processes"; "Symptoms", "Functioning", "Quality of life" etc. respectively. The actual measures such as "Visit frequency for depression treatment" could be incredibly useful if relevant benchmarks and records were kept. Alas, these are not currently done consistently in Finnish mental health care and thus cannot be properly analyzed. For future efforts to improve the quality of mental health care these could be of paramount importance. This study thus does recognize the existence on this vast and in depth work on the quality of mental health care but chooses to use the standards defined specifically for the Finnish mental health care system as they are more applicable.

The disorder and its measures

Depression is a major cause of disability pensions in the modern world. Hence, it is a significant burden for a society. This section describes the disorder in question, how significant it is in social terms and what tools are used to measure it.

Depression

According to (WHO, Depression, 2010), depression is a common mood disorder that has symptoms of depressed mood, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, low energy, and poor concentration. These symptoms might present in different severities or combinations whose levels are evaluated with assessment scales such as the ICD-10 (described in more detail below), and hence the treatment for each might differ. As with many other mental disorders, depression can be treated by altering the brain chemistry with psychoactive drugs, or with therapy that induces a change of brain chemistry with substances naturally occurring in the brain. In addition, for very severe cases, electroconvulsive therapy (ECT) might be employed as a last resort of treatment. It's effect can be characterized by a comparison with a reset button on a computer. The optimal choice of treatment methods is described in the Current Care guidelines below.

Depression is also amongst the leading causes of disability worldwide affecting some 121 million worldwide (WHO, Depression, 2010). In 2000, depression was ranked as the 4th

leading contributor to the global burden of disease as measured in DALY's. Since depression reduces both the quality life span as well as the total life span of a patient, it is a major financial issue for the national economy. According to the Finnish Center for Pensions (ETK, 2009) depression as a cause of early pensions has grown ten folds since the beginning of the 80's. The report does however underline that the number of cases of depression has not grown significantly since then. This development of early retirements due to depression makes research into the efficiency of its treatment even more current.

Social measures

An important social metric on the significance of a condition on a population is the Disability Adjusted Life Year (DALY). It is used to estimate the disease burden of a given condition on a population. DALY was first used by WHO in a global burden of disease study in 1996. Since then it has become a standard metric of the effect of a condition on a population. DALY is determined by the combination of two factors: Years of Life Lost (i.e. premature death) + Years Lived With Disability. The higher the value, the more the disease shortens the lives of a population. Critically however, the DALY is also weighted by a person's age. This is to account for the fact that young adults are considered to be the most valuable for a society – they have a lot invested in them, they have a lot to give back. The weighing according to age used by the WHO looks as follows:

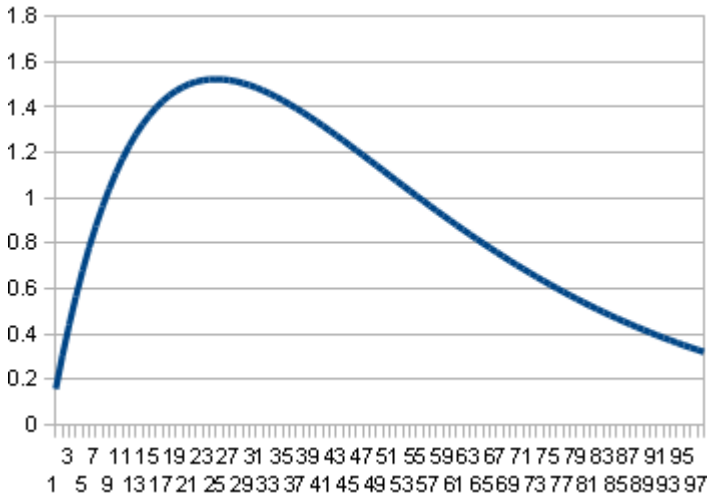

Figure 2 ***Age weighing in WHO's DALY analyses***

The proportion of depression in terms of age-adjusted DALY vs. the total DALY in Finland is some 12%. This is a significantly higher than the global average of approximately 5.2%. This

can be explained by the fact that conditions like HIV are not plaguing first world countries such as Finland. The fact remains though, that according to WHO measures, depression is proportionally as big an issue for Finland, as HIV is for Sudan.

Other important social metrics include demographic data such as early pensions, suicide rates and work ability. The Finnish Center for Pensions and Statistics Finland keeps records of early pensions and reasons for them. According to (Gould & Nyman, 2004), the number of early retirements due to depression has quadrupled since the 80's (although the condition has not become more common) and in 2003 accounted for as much as 16% of total early pensions in the private sector. In 2007, depression resulted in 32000 absences and some 4600 new early retirements in Finland (Käypähoito, 2009). Depression is also the most common contributing factor to suicides in Finland, where 66% of all suicides involved some level of depression (Lönnqvist) (worldwide, the equivalent value is only 30% (Bertolote, Fleischmann, De Leo, & Wasserman, 2004)). Globally, according to 2007 data by (WHO, Country reports and charts available, 2009), Finland was ranked 15th in suicides, with 18.2 suicides per 100,000 inhabitants. Hence, according to the major social metrics of early retirements and suicides, depression can be said to be a major social issue for Finland.

Another metric that can be considered both social and clinical, is the Social and Occupational Functioning Assessment Scale (SOFAS). It evaluates the condition of the patients in terms of their adaptability to the society, their ability to work and their interpersonal skills (Psychiatryonline, 2008). This scale differs from previous scales such as the Global Assessment of Functioning (GAF) in that it does not depend on the clinical severity of the condition – it only focuses on the patient's level of social functioning. Amongst other things, this means that the scale can (and is) used for a number of conditions including schizophrenia and depression. The results of the scale rate the patient somewhere in the range of 10-100, where 100 is "Superior functioning in a wide range of activities", 50 is "Serious impairment in social, occupational, or school functioning (e.g. nor friends, unable to keep a job)" and 10 is "Persistent inability to maintain minimal personal hygiene. Unable to function without harming self or others or without considerable external support." The use of SOFAS in HUS has been increased and promoted in the past years. However, the records are not yet consistent enough for the current study to use them.

The above social metrics are just examples of numerous possible ways to measure the health of a society or an individual (in terms of social skills). These measures are important when

investigating the effect of a type of treatment on a society, when building a major picture of chains of causes and effects between treatment procedures and the health of a population. Despite being interesting and vital from the wide perspective, these metrics are not in a major role in this study, for the following reasons. First, the scale of the study would change to another order of magnitude – it would be a task suited for several doctoral theses rather than a single master's thesis. Second, the permissions for the data from KELA would have been likely to take several months to get; this was not compatible with the schedule. Third, this paper uses the Current Care Guidelines as medically sound facts, and checking their validity (by an analysis of social metrics) is a major medical research project (that has already been done) way outside of the scope of this study.

Clinical / outcome measures

The immediate effect (vs. the societal effect) of treatment is assessed by clinical metrics – those that measure the severity of a condition. In addition, other clinical assessment scales are used to conduct the initial diagnosis of a condition. When patients come in for the first visit, their condition is measured with a clinical metric and diagnosed accordingly and they are then (ideally) treated according to the accepted standard. A clinical assessment scale can be performed in a number of ways, depending on the time and skill available as well as the desired precision of the results. These include questionnaires filled in by the patient, standardized sheets filled in by nurses or clinicians, or open-ended questionnaires where the latter questions depend on the former ones. The work, time and hence costs associated with each vary greatly.

A pair of commonly used scales to diagnose depression is the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, published by the American Psychiatric Association) and the International Statistical Classification of Diseases and Related Health Problems (ICD-10, published by the WHO). (Mezzich, 2002) has shown that DSM-IV is preferred for research purposes whereas the ICD-10 is preferred by clinicians. As summarized by (Gruenberg, Goldstein, & Pincus, 2005) , the definition of depression by the ICD-10 (as it is defined by the current care guidelines) and by DSM-IV is the following:

DSM IV	**ICD-10 depressive disorder**
Clinical significance	
Symptoms cause clinically significant stress or impairment in social, occupational or other important areas of functioning.	Some difficulty in continuing with ordinary work and social activities, but will probably not cease to function completely in mild depressive episode; considerable difficulty in continuing with social, work or domestic activities in moderate depressive episode; considerable distress or agitation, and unlikely to continue with social, work, or domestic activities, except to a very limited extent in severe depressive episode.
Duration of symptoms	
Most of day, nearly every day for at least 2 weeks.	A duration of at least 2 weeks is usually required for diagnosis for depressive episodes of all three grades of severity.
Severity	
Five or more of following symptoms; at least one symptom is either depressed mood or loss of interest or pleasure: (1) Depressed mood (2) Loss of interest (3) significant weight loss or gain or decrease or increase in appetite (4) Insomnia or hypersomnia (5) Psychomotor agitation or retardation (6) Fatigue or loss of energy (7) Feelings of worthlessness or excessive or inappropriate guilt (8) Diminished ability to think or concentrate, or indecisiveness (9) Recurrent thoughts of death, recurrent suicidal ideation without a specific plan, or suicide attempt or a specific plan	Depressed mood, loss of interest and enjoyment, and reduced energy leading to increased fatigability and diminished activity in typical depressive episodes; other common symptoms are: (1) Reduced concentration and attention (2) Reduced self-esteem and self-confidence (3) ideas of guilt and unworthiness (even in mild type of episode) (4) Bleak and pessimistic views of the future (5) Ideas or acts of self-harm or suicide (6) Disturbed sleep (7) Diminished appetite Typical examples of "somatic" symptoms are: loss of interest or pleasure in activities that are normally enjoyable; lack of emotional reactivity to normally pleasurable surroundings and events; waking in the morning 2 h or more before the usual time; depression worse in the morning; objective evidence of definite psychomotor retardation or agitation; marked loss of appetite; weight loss; marked loss of libido. For mild depressive episode, two of most typical symptoms of depression and two of the other symptoms are required. If four or more of the somatic symptoms are present, the episode is diagnosed: With somatic symptoms. For moderate depressive episode, two of three of most typical symptoms of depression and at least three of the other symptoms are required. If four or more of the somatic symptoms are present, the episode is diagnosed: With somatic symptoms. For severe depressive episode, all three of the typical symptoms noted for mild and moderate depressive episodes are present and at least four other symptoms of severe intensity are required.

As mentioned above, depression diagnosis is classified according to the number of symptoms present in a patient. The current study was initially planned to consider the two major groups of depression – F32 and F33. However, as the aim of this study is to give an example of a baseline analysis of a treatment method most likely to be easily standardized (as F32 is expected to be), the sample was quickly cut to only include patients with a diagnosis of F32. In addition, patients who were first treated for F32 and later for F33 would make the analysis excessively complex.

Their subgroup and definitions by ICD-10 are the following:

F32 Depressive Episode
F32.0 Mild depressive episode
F32.1 Moderate depressive episode
F32.2 Severe depressive episode without psychotic symptoms
F32.3 Severe depressive episode with psychotic symptoms
F32.8 Other depressive episodes
F32.9 Depressive episode, unspecified
F33 Recurrent depressive disorder
F33.0 Recurrent depressive disorder, current episode mild
F33.1 Recurrent depressive disorder, current episode moderate
F33.2 Recurrent depressive disorder, current episode severe without psychotic symptoms
F33.3 Recurrent depressive disorder, current episode severe with psychotic symptoms
F33.4 Recurrent depressive disorder, currently in remission
F33.8 Other recurrent depressive disorders
F33.9 Recurrent depressive disorder, unspecified

The above classification will be discussed in more detail further on, in the data analysis section. The reason for its introduction here is to show that depression (as many other disorders) is classified somewhat strictly according to a preset framework of criteria. The treatment procedure is hence selected to fit the subcategory of the condition, and precisely those procedures are described in the Current Care Guidelines.

Once the patient has been diagnosed with depression they are admitted into care and the severity of their condition (i.e. morbidity) is monitored. Ideally, this is done at initial admission, at the end of treatment and at intervals during treatment. A tool that can be used for this type of monitoring is the Global Assessment of Functioning (GAF). This questionnaire assesses the social functioning of a patient in terms of the symptoms of the disorder. It takes some 20 minutes to conduct and rates the state of the patient on a scale of 10-100. It has been recently taken into extensive use in HUS to gauge the effectiveness of a treatment. (Wahlbeck & Tuori, 2009) report that over 95% of inpatient stays have had their GAS-scores recorded at the beginning and at the end of the stay. However, by a preliminary estimate it is not recorded consistently enough for treatment periods in the outpatient care to be analyzed in this study. Where applicable however, as it has been done in (Wahlbeck & Tuori, 2009), it can be used to estimate benchmarks for how much treatment is sufficient (country wide average was 39,0 points at entry and 51,2 points at departure from inpatient care treatment). Theoretically, for outpatient care, it could also be used to suggest an optimal

treatment method. For example, “a patient with a GAF score of less than 70 should be given type 1 treatment. If this didn’t increase the GAF score, treatment 1.1 should be performed.”

Monetary measures

The QALY on the other hand is a tool used to evaluate the efficiency of a medical intervention. It considers the cost of the medical procedure and the QALY’s gained by that in terms of a cost per QALY and the resulting value can be used to see whether a given treatment is cost efficient (according to (NHS, 2010), if the cost per QALY exceeds £20,000 - a£30,000, the treatment is considered not cost efficient). The QALY is calculated by assigning a weight to a patient’s life year depending on the severity of the condition. A perfectly healthy person would have a coefficient of 1.0, and a dead person would have a value of 0.0. Below is an example of a QALY calculation from (NHS, 2010):

Patient x has a serious, life-threatening condition.

- If he continues receiving standard treatment he will live for 1 year and his quality of life will be 0.4 (0 or below = worst possible health, 1= best possible health)
- If he receives the new drug he will live for 1 year 3 months (1.25 years), with a quality of life of 0.6.

The new treatment is compared with standard care in terms of the QALYs gained:

- Standard treatment: 1 (year’s extra life) x 0.4 = 0.4 QALY
- New treatment: 1.25 (1 year, 3 months extra life) x 0.6 = 0.75 QALY

Therefore, the new treatment leads to 0.35 additional QALYs (that is: 0.75 –0.4 QALY = 0.35 QALYs).

- The cost of the new drug is assumed to be £10,000, standard treatment costs £3000.

The difference in treatment costs (£7000) is divided by the QALYs gained (0.35) to calculate the cost per QALY. So the new treatment would cost £20,000 per QALY.

In addition to the above method of assessing the viability of treatment for a single patient, the financial department can measure other factors in terms of costs. For example, if general data such as early pensions caused by depression in a given population were easily available, they could be measured against the overall costs of treatment methods and organizational structure.

This is however a major process that would require a thorough analysis of demographics, the causality would be very difficult to determine and the whole study would likely take years. For the purpose of this study however, the Current Care Guidelines are taken as the medical truth. They do specify what level of morbidity (severity of condition in terms of symptoms) requires the costly specialized care of secondary health care (erikoissairaanhoito), and which patients should rather be treated in primary health care (perusterveydenhuolto). As said above, this is the central question of this study – how does reality differ from the guidelines and hence how much costs does HUS (and consequently the society) bear as a result of excessive treatment in secondary health care.

Treatment methods

This section covers some central concepts and standards associated with treatment methods of depression. First, a distinction between outpatient and inpatient care is explained. Second, the official standard of treatment of depression is described. Third, a more general treatment framework based on both the CCG and experience of doctors is presented.

Outpatient vs. inpatient care

The two basic types of clinics that this study is concerned with are outpatient and inpatient care clinics. The principal difference is in that at an outpatient care clinic does not keep patients overnight; rather they only come in for visits. This type of care is also sometimes referred to ambulatory care. Inpatient care on the other hand is the kinds where patients are signed into a hospital for a stay. There a certain significant advantages in outpatient care and the government has been promoting that method over the traditional hospitalizations.

According to (Wahlbeck & Tuori, 2009), out of the Nordic countries, Finland currently has by far the greatest proportion of hospital spots, almost 1,0 per 1000 inhabitants. This is despite the fact that the amount of inpatient patients in psychiatry has decreased to a quarter of what it was in the 70's (although the aim is about 0,5 spots per 1000 people, like Sweden currently has). The progress thus far is a result of the modern treatment policy that promotes outpatient care because rather than giving mental patients a humane place to exist (i.e. commit them to an institution), they are quickly treated and re-established in the society. In addition, out care

patients are not cut from their social networks for the duration of the treatment. Finally, outpatient care is significantly cheaper than inpatient care – reducing the proportion of patients receiving inpatient treatment, along with shortening treatment periods, is one of the principle methods of reducing costs in psychiatric healthcare. Finland has made considerable progress, but there is still plenty of room for improvement.

Current Care Guidelines – CCG (käypä hoito suositukset)

The Current Care Guidelines for depression were developed by a work group headed by Erkki Isometsä in 2004 (Käypähoito, 2009). They are based on an extensive analysis of international (controlled) studies of the condition. Once the diagnosis has been made according to the ICD-10 criteria described above, the CCG define an optimal treatment method for depression in terms of the medicine used and procedures performed (this entirety of treatment procedures and visits is called "hoitojakso" and referred to as "treatment package" in this paper) . Although they are in a central role for the analysis of the results of the current study, one must keep in mind that they apply to both primary health care (not investigated here) as well as secondary health care. The expected results of this study are thus expected to differ significantly from the values presented in the CCG. However, the main argument for change will remain: if the treatment described in the CCG has not had an effect, it is no longer rational to keep the patients in the secondary health care system, and they should be transferred to primary health care where they will are provided with ways to cope with their condition (e.g. support groups). A short version of some key components of the CCG are presented below:

- Depression is treated in 3 major stages as shown (acute, continuation, follow up):

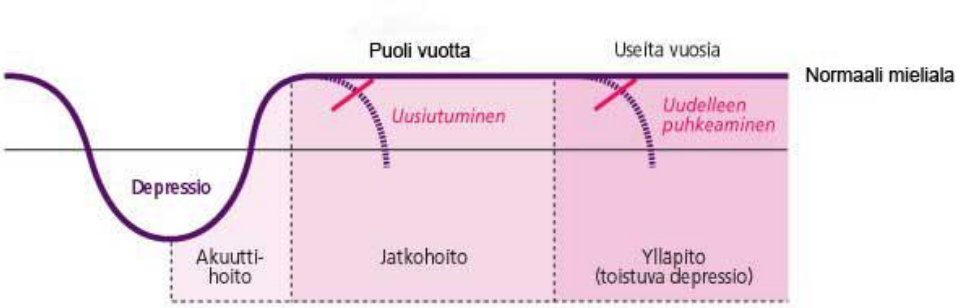

Figure 3 ***Stages of treatment of depression according to the CCG***

- The aims of each stage are:
    - acute treatment: remission of symptoms, should be conducted until this goal is achieved (e.g. under 8 points on the Hamilton scale, or under 10 points on the Beck scale)
    - continuation treatment: to prevent the resurfacing of symptoms (relapse)
    - follow-up treatment: to prevent an onset of a new depressive episode
- The techniques that can be used in the acute phase:
    - psychotherapy
    - medication
    - the both above
    - in some cases ECT
- Regardless of treatment method, a depression patient requires checkups during acute treatment and for at least half a year hence
- The effectiveness of treatment and morbidity is to be monitored at the checkup visits
- The time frames can be summarized as follows:
    - the symptoms of 40-50% of patients disappear in 6-8 weeks of drug treatment, and another 15%-25% of patients have a partial response (treatment should still be continued as remission would otherwise be very likely)
    - visits in the acute phase should be frequent (once in 1-3 weeks, even more often if self-destructive tendencies are significant)
    - if there is no significant response to treatment in 6-8 weeks of drug treatment, medication should be reconsidered
    - drug treatment should be ideally continued for 6 months after the remission of symptoms
    - in cases of third or more recurrent depressive episode, drug treatment should be continued indefinitely, and check-up visits should be conducted at least once every 6 months
    - psychotherapy in the acute phase is alone effective for about half of patients within 4-6 months
    - the acute phase and the continuation treatment should thus take up to 9 months: up to 1 month of evaluation (can be less), up to 2 months of drug treatment, up to 6 months of combination of drugs and therapy

- A vast majority of depression patients can be effectively treated in primary health care:
    - mild depressive episodes with a good response can be effectively treated according to the above guidelines
    - the continuation phase and especially the follow-up phase can be conducted by depression nurses (depressiohoitaja) where procedures and methods are standardized and the cost of personnel is lower
    - psychiatric consultation must be available to the primary health care staff for cases where the qualification is insufficient yet there is no apparent need for specialized care
    - the main causes for directing a patient into secondary health care are:
        - severe or psychotic depression
        - drug resistant depression
        - a patient with multiple diagnoses or severe self-destructive tendencies
    - the estimate of a proportion of patients referred to secondary health care is 5-12%
- A number of quality criteria are also suggested in the CCG, however without definitive benchmark values. Some of them are:
    - is the number of patients with a depression comparable to the national average
    - what proportion of patients has received medication
    - in what proportion of cases have clinical measures been employed
    - what proportion of patients achieve complete remission

In an interview, Dr. Isometsä (the chairman of the committee responsible for CCG of depression) agreed to the following pattern of depicting the acute phase treatment process in terms of time. Class 1 patients (nominally, in terms of severity and responsiveness to treatment) comprise some 40-50% of the total, and they respond to solely drug treatment with a remission of symptoms. Class 2 patients (more resistant to treatment) would carry on to therapy along with a drug treatment for a number of weeks. Class 3 patients would require electro-convulsive therapy (ECT). Although this division was crude, it shows the pattern and the approach in which patients can be divided up into severity classes and hence the durations of their treatment would be different. The current study will refer to the CCG when comparing the durations and frequencies of visits in the sample data.

General consensus of HUS management

Based on the Current Care Guidelines and clinical experience, a group of doctors (includes the head of HUS psychiatry, main clinicians of Jorvi and Peijas) at HUS have defined an approximate treatment path for a depression patient. The idea is that this standardized treatment method could simplify billing and streamline processes. Unlike the CCG, it is unofficial and the times are not defined explicitly. In fact, this study might be used to adjust the exact time periods of treatment and the allowed variances. Several things are clear in this proposed model: a) there are clearly defined time periods b) there are clearly defined frequencies of visits c) there are several exit points for patients in the process. In terms of the number of patients in a system for the duration of the treatment, the pattern should roughly look as follows:

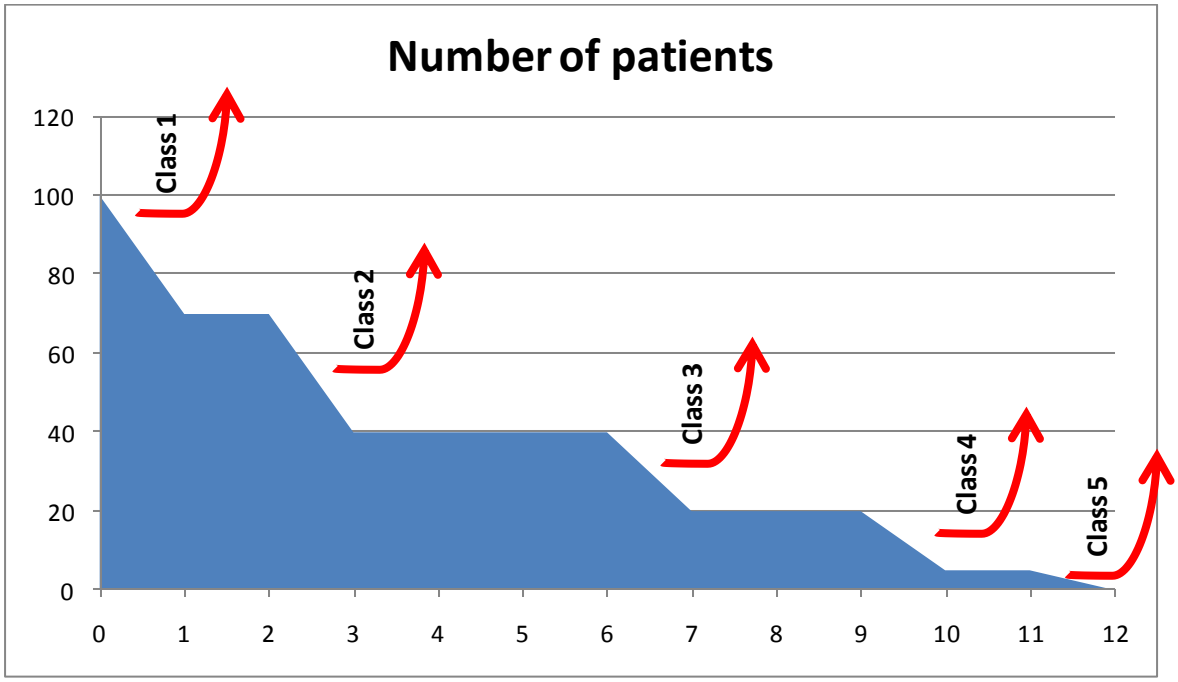

Figure 4 *Proposed generic model of treatment of depression*

Similar to the CCG, this proposed model would have a number of patient groups (labeled above as "Class X"), and they would leave the system at given points in time. In the above example, time 0, where class 1 (those that are found not applicable for this treatment) leaves the system, could be the first visit where an initial analysis is made. T=2, where class 2 leaves, could be the point where medicinal treatment has taken effect and additional treatment is not needed. Exit point of class 3 would be the point where medicine + therapy has taken effect and class 4 would be where ECT was effective. Class 5 would then be the patients whose condition did not respond to the standard treatment (Dr. Isometsä mentioned in his

interview that this amounts to approximately 10% of the total, significantly higher for those who end up in secondary health care). The consensus suggests, that these 10% (class 5) should still be removed from the system into primary health care since the specialized treatment available in secondary health care does not benefit them. Primary health care would treat these individuals with a more gradual method, which requires less expertise but more time. This treatment (regular check up visits, occasional doctor visits and support group activities) is largely performed by depression nurses and social workers who have received additional training, but who are still less qualified and hence less costly than specialized doctors.

Pricing

The two principal approaches to pricing that are used in public health care in Finland are treatment process pricing and single procedure pricing. The two are principally different in their applicability, in their determination, in their motivational aspects and in their complexity in terms of billing. This section goes through the two basic ways in which psychiatric treatment in Finland (in fact medical treatment in general) can be priced. First, the single service approach is covered. Then, the package-based approach is explained in some detail and its most prominent example, the DRG, is introduced. Finally, some special cases of pricing are mentioned.

Per-service

The service-pricing approach sets a standard cost for a service and bills the patient accordingly. Generally, these include visits to a doctor, visits to a therapist, an ECT session, a day of treatment at the hospital and so on. This is the approach by which pricing has traditionally been done in psychiatry in Finland. More specifically, since psychiatry does not have somatic treatment services (e.g. surgery) save for ECT, the two main billing articles are "an outpatient visit" and "a day of inpatient care". These services have set costs that are listed in the HUS price list. How the pricing works on practice, will be shown in the data analysis chapter (and the official price list for 2010 can be found in appendices). As a result, the bill for a patient is ought to be larger if the number of visits is greater, and significantly larger if the patient spends time in inpatient care. On the other hand, if a patient only visits the

outpatient clinic once, they will be charged for that single visit. However, if a patient is treated "excessively", the bill will keep on growing as the visits accumulate (and it will be respectively smaller if a patient does not finish a treatment plan, i.e. quits taking the medicine ahead of time). In other words, although this method is clear and simple in terms of billing, it lacks the remarkable trait of the latter alternative of pricing: motivation to stick to standard procedures.

Per-package

The treatment package pricing approach bills a patient for a whole standard procedure of treatment. The central benefit of this pricing system are its motivational aspects: excess treatment would be avoided by the personnel since it would still be billed by the average, and patients would be more motivated to stick to the treatment plan since the whole thing will have been paid for. This raises the question of whether the patients would be given sufficient treatment. But it is answered by the fact that extreme cases (really short or really long, over 2SD off the average) are still billed by the simpler pricing method.

In somatics (in fact, in all medical fields except for psychiatry), this approach has been implemented widely with a pricing tool called the Diagnosis-Related Group (DRG) since the early 90's (psychiatry was then left out of the reform). Dr. Jorma Lauharanta has been actively involved in that implementation of DRG and below is a short version of his explanation of the approach:

- the total costs of a single patient are considered as follows

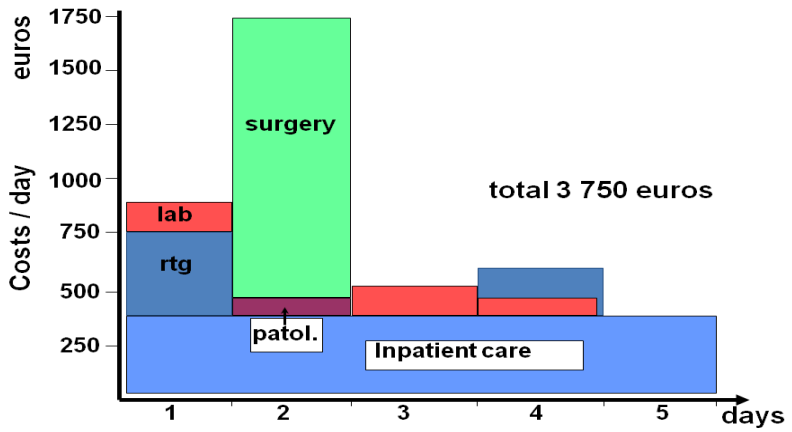

Figure 5 *An example of the composition of the total cost of a treatment package*

- a sample of total costs is plotted on a histogram
- data points outside ±2SD are dismissed as outliers, the ones within are considered "normal" processes

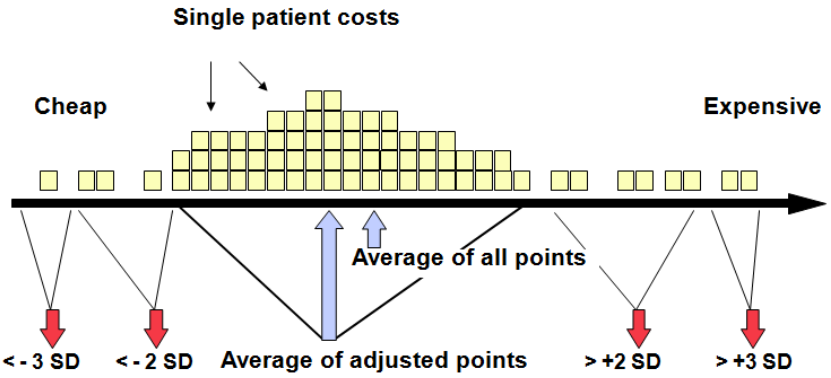

Figure 6 *The method of finding an average cost for a treatment package*

- if a package cost lies within the normal range, it is billed by the average, otherwise by single procedures

The DRG scale is then further refined with weighting of procedures so that a per-DRG point scale can be constructed. This can then be used to investigate the efficiency of given procedures in terms of the big picture of field of medicine. According to (Lauharanta, 2009), in addition to DRG improving the quality of data making efficiency tracking possible, it actually increases efficiency itself dramatically, as shown below:

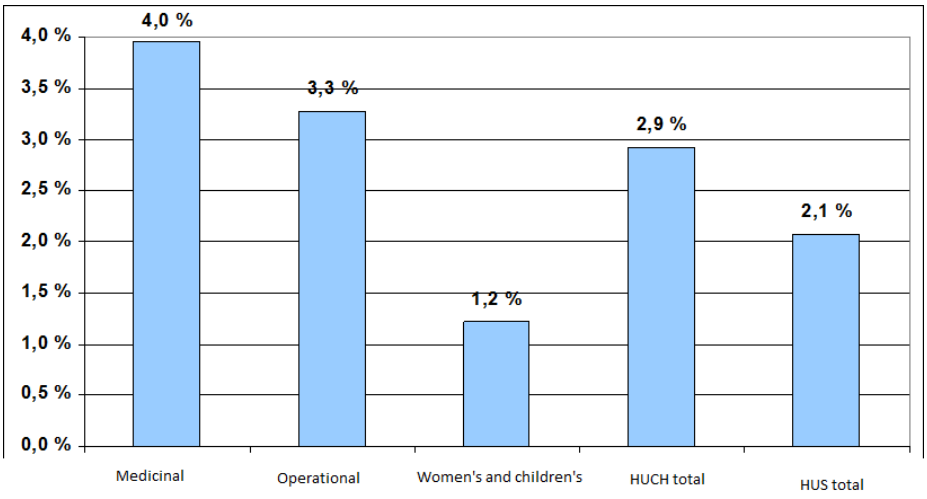

Figure 7 *The increase in efficiency from 2007 to 2008 in terms of DRG / employee yrs*

Alas, this technique is not used in psychiatry due to some limitations that are discussed next. A study assessing the applicability of DRG was conducted at the university of Oulu, and

published as a graduate thesis entitled "Diagnosis based grouping logic for pricing psychiatric care ward episodes – NordDRG in adults psychiatry". It suggests that DRG is poorly applicable to psychiatry for the following reasons:

- There are too many DRG classes which results in some groups being too small to get a distribution where a reasonable average can be calculated
- Some groups are too big (or vaguely defined) which results in huge variance of treatment costs within groups – again, no reasonable average possible
- Treatment packages are not defined and hence recorded poorly
- When constructing a DRG, the sample size is limited to a single hospital since the treatment practices vary greatly across hospitals
- The study thus suggests that
    - the DRG classification should be revamped to reflect patient groups and treatment methods more accurately
    - use of DRG in pricing of long term conditions should be scrutinized

So according to this empirical quantitative study, the shortcomings of DRG in psychiatry can be essentially attributed to the lack of standard procedure. If there were standards (as the current study is attempting to promote), there would be sufficiently large sample groups, there would be less variance in the treatment groups and so rational DRG's could be developed for psychiatry. In addition, the current study addresses the question of treatment standardization in depression, which the HUS management believes to be a process homogenous enough to be packaged into a DRG-like group (or several DRG-like groups).

Additional services

"Additional services" refers here to a number of additional services mentioned in the HUS price list including consultations, phone calls and letters. The number of these services is ought to be increasing with recent developments of increasing the proportion of patients in primary health care and using consults from secondary health care for support. At the current stage however the general attitude towards billing of these services seems inconsistent. With no precise guidelines and a lack of motivation to do so, they go largely unrecorded whereas they could ideally comprise a significant part of income for HUS. Due to the lack of their consistency, they cannot be properly analyzed in the current study.

Data gathering

This chapter describes the process of data gathering and assesses the quality and the applicability of the data. The first subchapter deals with the process of getting the necessary data and mentions some difficulties encountered during. It includes an assessment of quality and applicability to the study and hence the reasoning behind data selection. The second subchapter goes through the process of data refinement, the reasoning for it and the end result – the data left for final analyses.

Raw data

This subchapter deals with the raw data: of how it was obtained, of its quality and its applicability. This stage of the study turned out to be a lot more cumbersome than initially expected because of mainly technical issues. Unexpectedly, a lot of time had to be devoted to the actual extraction, to reformatting and to the assessment of applicability. In addition to different formats, a lot of the raw data fields would be tautological (e.g. "duration of visit" and "number of days spent at visit" are essentially the same thing; they probably exist for technical reasons), and a lot of it could not be used for further analyses at all (e.g. "quetype", the type of queue) and another lot was of unusable due to poor recording quality.

Data gathering process

The main source of data for the current study is the HUS IT system called Ecomed, developed for tracking patient records by Datawell Oy. Information about every patient visit at HUS is kept in this database. Its central benefit for this study is the fact that there is no personal data within it – all records are recorded with a nominal Patient ID, a value assigned to a patient with references to personal information stored in another database. The software itself is tied to a massive database of patient records, and it has a number of very useful tools for data analysis. In addition to a wide array of query possibilities, it can present the data in terms of histograms, distributions etc. However, to derive some central variables out of the data would have required exporting the data into a spreadsheet software such as MS Excel for a number of manipulations to be performed. In addition to this, learning the use of Ecomed would have been necessary to be able to perform the desired analysis. Moreover, Ecomed is only available

on HUS intranet – a system that would have required permissions for the performer of the study or the use of guest credentials and a personal presence at the organization. Neither of these options was impossible, but logistically complex and more time consuming than the exporting of data. The problem with exporting however was that the needed data was only possible with some indexing values and a small number of queried variables, whereas the necessary complete information was impossible to retrieve with the Ecomed interface in HUS intranet. An access to the complete database was hence necessary – a privilege only available to the administrators of the database, Datawell personnel.

For the above reasons a decision was made to contact Datawell and ask for a data extraction directly from the database into an Excel file (straight from the source, so to say). Mr. Riku Kuikka was the contact person who promptly extracted the requested data from the database and placed it in compressed files onto HUS intranet. The files were then retrieved and combined into a single database of 178 columns by over 200,000 rows. There were some technical difficulties in this process as the older of version of Excel used only supported some 65,000+ rows of data, the columns were in different orders and formats in each file (each file corresponded to a single year of observations). The combination (and hence sorting and formatting) process was painfully slow as the file grew to over 120 MB in size and the study computer was struggling to deliver the processing power required. An example of a frustrating outcome at this stage was the following: sorting by patient ID was started and the computer would descend into a state of processing. Some 30 minutes later it would return an error claiming "insufficient memory with given resources". The data would then have to first be sorted in smaller batches and combined into the final file.

Assessment of the Raw Data

The problem of limited resources was overcome and a final version of raw data was obtained. Although very comprehensive and hence useful for the study, it was still grossly huge and thus unworkable. There was also an immense proportion of irrelevant or poorly recorded data (this would be later refined in later stages). An analysis of the raw data is still useful to illustrate the levels of data recording and possibly excessive holding capacity costs. The full list of data fields is available in the appendices.

General Description

The data is comprised of every visit to HUS of patients with diagnoses F32 and F33 (depressive episode and recurrent depressive disorder respectively) from treatment points of Jorvi and Peijas hospitals for 6 years, 2004-2009. This means a total of 223,520 rows of data across 177 columns. Both diagnosis groups F32 and F33 were included "just in case", but F33 was later discarded (by a suggestion of the client) since the treatment for a recurrent depressive episode is different from that of a first depressive episode, it has greater variability and is hence a lot more complicated to package into a standard treatment path. The reason for extracting data just from Peijas and Jorvi (as mentioned before) was to keep the possibility to analyse the impact of different treatment cultures in hospitals of comparable sizes and practices. The most crucial point about the selected data is time period, for 6 years from 2004 to 2009. This was done to ensure that as much of the data as possible would consider the true irst and last visits (since it was unknown whether markers for first visit and last visit were consistently available in the data, later found to be inconsistent), rather than just the first recorded visit. Duration of treatment is defined as the time (in days) between the first and the last visit, illustrated below:

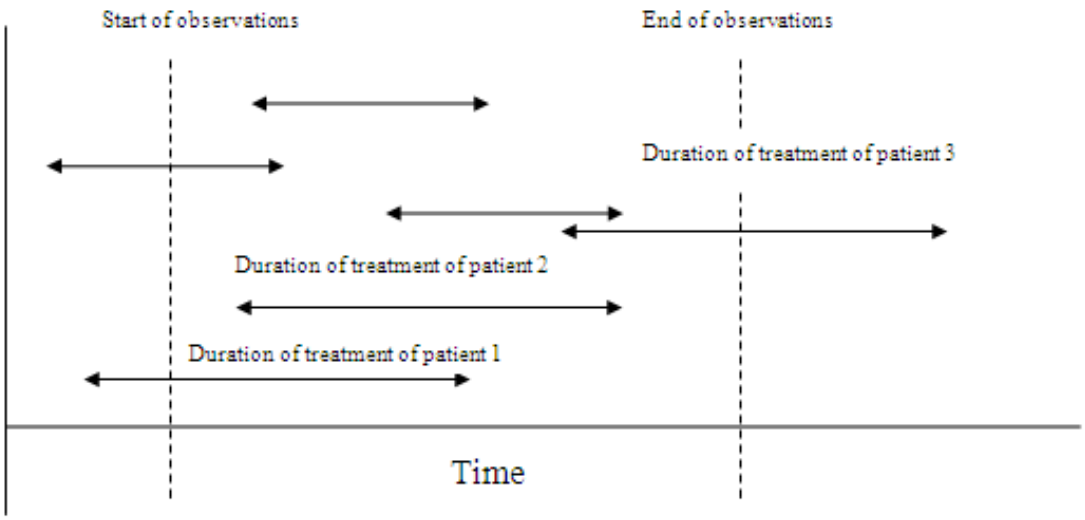

Figure 8 *Bias towards shorter periods due to the lack of markers of star and end*

The wider the range of observations, the smaller the proportion of untruly short treatment periods. This would create a bias towards shorter treatment periods, since it might be impossible to determine the true first and last visit and the "untrue" treatment durations would be indistinguishable from "true" durations (this question is addressed later in the data analysis chapter). In fact, when the durations of treatment were calculated for a single year, a large

number of patients appeared to be treated for the full year (whereas in fact, their treatment started before, and ended later).

Data of Poor Quality

A number of columns in the raw data at first appeared to be very valuable for the study but later turned out to be of too poor quality to used. A central reason for this is the fact that treatment periods (or paths, or packages – "hoitojaksot") are not used in psychiatry. What is officially referred to as a treatment period is a number of visits and procedures to compile a complete treatment path (versus "all visits between the first one and the last one"). Not surprisingly, as treatment periods (or packages – "hoitojaksot") are not used in psychiatry, their markers such as "first visit" and "last visit" are not consistently recorded in the database. In fact, they would only be recorded if treatment packages were defined and followed. As a consequence, it would remove the need for a study as this one – since packages were known and defined anyway. Some data that was thus discarded included such variables as "complete treatment package", "ended treatment package", "GAS at beginning", "GAS at end" (as mentioned before, GAS is consistently tracked for inpatient stays, not outpatient packages), "DRG", "date of beginning of queuing", "queue days", "psychiatric drug treatment", "urgency level" and "product". It is impossible to give a quantitative analysis of the level of inconsistency of data recording since it is essentially non-applicable to a system with no defined treatment packages. For example, it is impossible to say how many "start of queuing" records are missing since it is not explicitly defined, what this queuing is to – the first visit, the beginning of a treatment period or the next visit (it would make no sense to record queuing times for the next visit since it isn't really that, it is just the time until the next agreed visit). An analysis like this (the quality of data recording and hence internal reporting) is not a primary target of the current study, since it is not actually applicable to the current treatment system. However the above general overview suggests that this sort of data is irrelevant and/or poorly recorded. In either case, it cannot be used to gauge the quality of recording and internal reporting.

Yet, as Dr. Lauharanta points out based on his studies of the implementation of packaging in somatics, the quality of data recording and thus that of internal reporting increase with the introduction of a packaging system such as the DRG. One might thus argue that the quality of this data is likely to increase, if the proposed changes were to be implemented. In addition, it

should be noted, that the presence of these variables in the database once again suggests that treatment packages can be recorded. Although currently only used in somatics, the platform for recording and analysing treatment packages also exists for psychiatry.

Data Irrelevant for the Study

The raw data table included plenty of information that was of no use for the analysis conducted further. These included several indexing variables (such as record ID, episode ID), some technical variables that were also included in other variable (such as "day of visit", "month of visit", "year of visit" vs. "date of visit"), a large number of completely irrelevant fields (such as "hour of visit"; i.e. the time on the clock when the patient came in, "age group", "procedure code", "municipality to be billed"), and finally one that was not part of the target of the study (diagnosis of F33, rather than F32). The irrelevant or redundant data made the worksheet unworkable and did not contribute to the final analysis. For example, "type of visit" could have been very valuable, but it was inconsistent and the type of visit could also be derived from the "cost of visit" by examining the price list of visits. Some data was thus combined and some was discarded. What was left then was a refined version of the data that included just the information vital for the analysis conducted.

Refined Data

The data was divided into three separate worksheets: all visits, patients with more than one visits, patients with a single visit with 134476, 10275 and 3310 rows respectively. This division was done to simplify the sorting, the querying and the analyses that would be performed. The data was sorted, calculated and reformatted using MS Excel. This was because Excel is easy to use and it has the necessary functions. The following paragraphs describe the data fields and their applicability to various analyses.

Indexing Variables

The primary indexing variable of the data is "Patient ID". This is a unique code assigned to each patient in Ecomed. Although patient ID is unique to each patient, it is repeated for each

visit that a given patient has had at HUS. Indexing by this variable would allow an analysis of both single visits as well as single patients. The visits on the other hand are indexed simply by the automatic indexing table generated by the statistical software; they hence range from 1 to 134476 on the "visits" sheet.

Variables in the Data

A number of important descriptive variables were readily available in the data sheets provided by Datawell. These are "cost1", "product", "totcost", "date of visit start", "date of visit end", "type of visit", "product class", "duration of visit", "diagnosis", "place of treatment" and "gender". Cost1 is the cost of a visit. It should ideally be determined by the price list of HUS, and vary depending on the product. The product variable is a code such as 7401 ("other visit") or 7201 ("first visit"), which corresponds to the visit to the product to be billed. Unfortunately, over 80% of all products were "other visits" which presented a problem in the later analysis. Totcost is the cost of the visit itself plus any procedures performed. This could give an insight into cost variances (later discovered to be inapplicable since the majority of totcosts were identical to cost1).

The date of visit variables are central in the later use as reference point for both time progression analyses as well as derivations for treatment period lengths and frequencies. For outpatients the two dates would equal (since an outpatient leaves the clinic the same day he arrives). The type of visit (outpatient or inpatient) variable is just another classification that could explain differences in pricing or reveal patterns in treatment methods (later found to be unusable since 98.8% of all visit types were outpatient visits – this would also be redundant since "duration of visit" would tell the same thing). The product class shows whether the visit is billed by DRG or with other methods. This variable was left just to confirm that DRG is indeed not used in psychiatry (despite the fact that a column for DRG does exist, and has been diligently filled with one DRG code) – 98.8% of all visits are "non-DRG" based.

The diagnosis variable would be central in further analyses, since one of the questions for this study is "how do treatment methods differ for different diagnoses". As mentioned before, the data for F33 (recurrent repressive episode) were dropped from the sample. The ones left would hopefully turned out to demonstrate different treatment methods and hence conclusions could be drawn for each individual diagnosis, and some variance in the data could be

explained by the diagnosis group that an observation belongs to. Unfortunately this data had a lot of different formats (e.g. F32.2 would be written as F32.2, F32.20, ‘ F32.2) and would hence result in odd statistics – it had to be corrected by means of a strenuous formatting and testing on constantly jamming hardware. Of equal importance as a classification variable was the place of visit. These were found as codes for individual clinics in the data. Separate clinics belong to greater entities that are the Jorvi and Peijas hospitals. These observations thus had to be refined from “clinic x,y,z” into “Peijas” or “Jorvi”. Finally, the gender variable was also available in the data. This was expected to be of minor importance in further analyses but was kept just in case – for the sake of curiosity sake.

A summary of some visit variables that were kept of the original data (in the “visits” sheet):

Item	**Count**	**% of total**
Place		
Jorvi	74363	55.3
Peijas	60104	44.7
Year of visit		
2004	25793	19.2
2005	24487	18.2
2006	23974	17.8
2007	21194	15.8
2008	20469	15.2
2009	18550	13.8
Diagnosis		
F32.0	6009	4.47
F32.1	53887	40.07
F32.2	42714	31.77
F32.3	9653	7.18
F32.8	1360	1.01
F32.9	20844	15.50
Gender		
Male	44911	33.4
Female	89556	66.6

Derived Variables

There was a number of variables that were not readily available in the data but had to be derived for further analysis. Essentially, everything that had to do with the “per-patient” approach had to be calculated since the data is Ecomed is on the “per visit” basis. These, and several others that seemed necessary for future analyses, are: “Duration of treatment”,

“Duration of visit”, “Number of visits”, “Frequency of visits”, “Total cost” and “Month of visit”.

Duration of treatment is one of the central variables used in further analyses. It is simply the period (in days) between the first and the last visit for a given patient ID. The dates of visits are documented well and thus this variable has a high degree of consistency. Yet although it used to draw out some conclusions in the further analysis, this variable is subject to two major errors: the bias towards short durations (as explained before) and a number of seemingly very long durations, caused by the fact that separate depressive episodes do not have separate markers. A patient with two visits three years apart clearly has separate episodes, not two infrequent visits in a single episode. In addition, there was a separate column for the duration of visits in the “visits” sheet that would allow us to see the duration of treatment up to a given point. For the last visit this would equal the total duration, for the first visit it would be zero, and for others it would be somewhere in between. Finally, the month of visit column on the visits sheet is simply shows the duration of treatment in months. This was included to ease the processing load on the statistical software (it would classify the durations in months rather that in days).

The duration of visit is the time between the start of a visits and its end. For outpatient visits this variable would always be 0. Although outpatients would be in a central role in this study, the variable was still kept just in case. When this variable was calculated, it revealed an error in the recording process. There were several (15 or so) visits that did not have an ending date. This caused Excel to read the missing date as 01/01/1900 resulting in treatment periods of -40,000+ days. To correct this error, it was necessary to go back to the raw data and pick out the finishing date by the “number of inpatient care days” column. In addition to the single visit lengths, a cumulative per-patient length of visits was calculated. This would make further classification possible by allowing a division of the patients into those with inpatient care stays and to those without.

The number of visits and the total cost are somewhat self explanatory. These are just the summed costs and visit tallies per patient. Here it should be pointed out that “Total cost” and “Totcost” are different variables. The former is a derived variable – the sum of all costs per patient, whereas the latter is the raw variable from Ecomed – the total cost per visit. The number of visits, as the duration of treatment would also have a separate “up to” column in the visits sheet, where the number of visits would accumulate to the overall sum with time.

Data Analysis

This chapter goes through the process of data analysis and summarizes certain central findings. The analyses were mostly conducted using Minitab statistical software originally developed in Pennsylvania State University. The reason this software was selected is that a copy was already available. The majority of the following analyses only consider patients with more than one visit, and those with no inpatient care stays. The other two groups will be covered in less detail in the final subchapters since that analysis is not applicable to the patterns identified elsewhere in the analysis. As said before, the aim of this study is to find patterns in treatment methods, and patients with a single visit or inpatient care stays comprise a separate subgroup or fall into a different classification technique respectively (by diagnosis, by type of visits, by place of treatment etc.). It should also be once again noted, that all of the data is biased towards shorter treatment periods (and lower costs and fewer visits than in reality) due to the sampling method described in the previous chapter. Findings of this chapter would hopefully enable the formation of some key conclusions that would then be tied to practice in the final chapters.

The first subchapter analyses the formation of costs in the sample and summarizes the findings. The second subchapter deals with the arrangement of frequencies of visits, the third subchapter summarized the question of outpatient care and inpatient care, while the fourth subchapter analyses the durations of treatment and identifies the patterns found therein.

Cost per visit

The cost per visit is ought to be determined by the product of the visit. Product prices are assigned for every year according to the below classification and the place of treatment (the price list for 2010 can be found in the appendices). The possible categories are:

Code	Product
270	A day of psychiatric treatment, i.e. inpatient care
6101	Emergency visit - “Päivystyskäynti”
7201	First visit
7401	Other visit
7501	A daytime visit – “päiväsairaanhoitokäynti”
7601	Rehabilitation visit
7701	Phone call / letter
7801	Consultation

As mentioned before, the vast majority (over 80%) of visits were “other visits”. However, the data showed that there were several different costs for product 7401. For the following analyses only data for 7401 will be considered to limit the amount of variance (this only includes outpatient visits). This begs the question: what determines the difference? The price list specifies a particular price for every clinic. Since the distinction into clinics was removed in the data refinement process one cannot confirm that the differences in cost stem from this fact. Just to make sure, a histogram was plotted to show that costs did vary within place of treatment (as in Jorvi vs. Peijas, not the separate clinics), but did not depend on them:

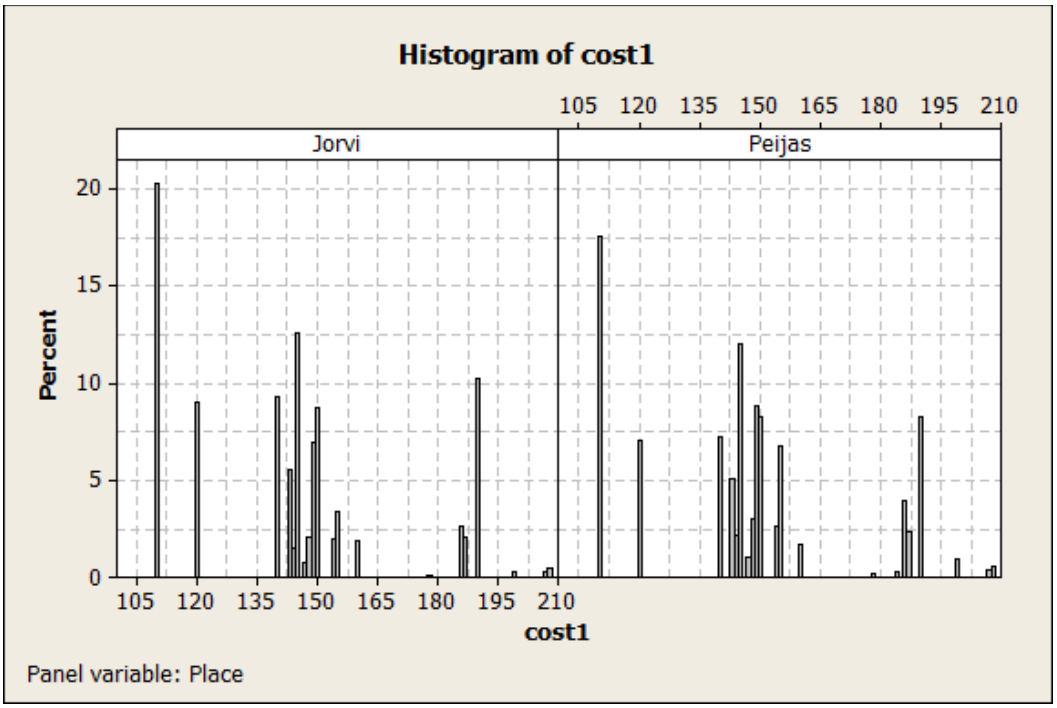

Figure 9 *There is signification variability in visiting costs for each hospital*

Since the place of visit did not appear to be the distinct determinant of cost classes, the possibility of grouping by the year of a visit was considered. After all, the price list is compiled for every year and is hence subject to changes. A scatter plot of cost vs. date of visit reveals that there are indeed distinct levels of costs for every year:

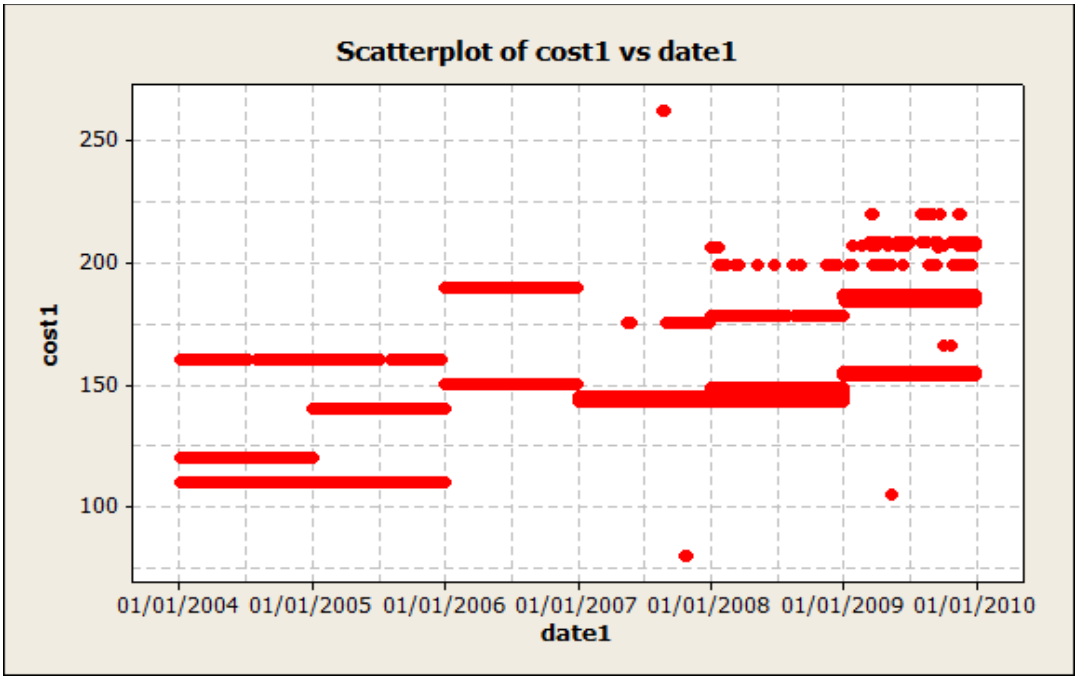

Figure 10 *The costs per visit vary greatly over time*

The HUS price list has a number of different costs for different clinics and there is reference to something called the price group. The data for the costs of past years is not readily available, so what follows is an attempt to determine them from past data by splitting the observations into years and identify the major cost groups. Below is a marginal plot depicting the costs of a visit for year 2004:

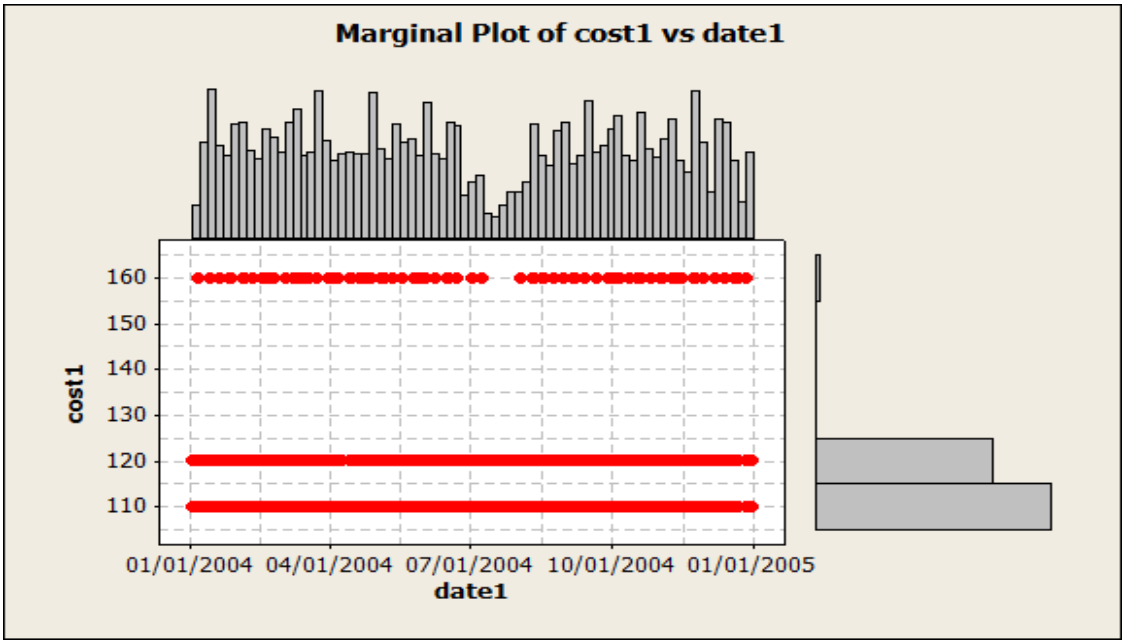

Figure 11 *In 2004 there were two major and one minor cost classes*

This showed that for the year 2004, there were two distinct groups of visit costs: 120€ and 110€. Also there was a minor number of visits worth 160€, this class is further referred to as an outlier (it might have been a cost for a small clinic that was later integrated into a bigger hospital and hence has its own cost). In a similar manner, this analysis was conducted for all the following years and the results were (the minor variances are dismissed as rounding errors):

Year	Cost 1	Cost 2	Outlier 1	Outlier 2
2004	110	120	160	
2005	110	140	160	
2006	150	190		
2007	143, 145			
2008	143, 145, 148, 149		178	
2009	154, 155	184, 186, 187		208

In the above table costs 1 and 2 accounted for well over 95% of all visit costs, while being of comparable size with respect to each other. Since the division was this considerable (albeit crude – it makes the assumption that Cost X in a given year corresponds to Cost X in another), it would be interesting to see whether the cost class of visits would change over the treatment period. A histogram of cost classes over time showed that the grouping seems valid, with the exceptions of years 2007 and 2008, when Cost 2 didn't exist.

An analysis of visit cost classes versus visiting month yielded the following results, presented below in graphical form:

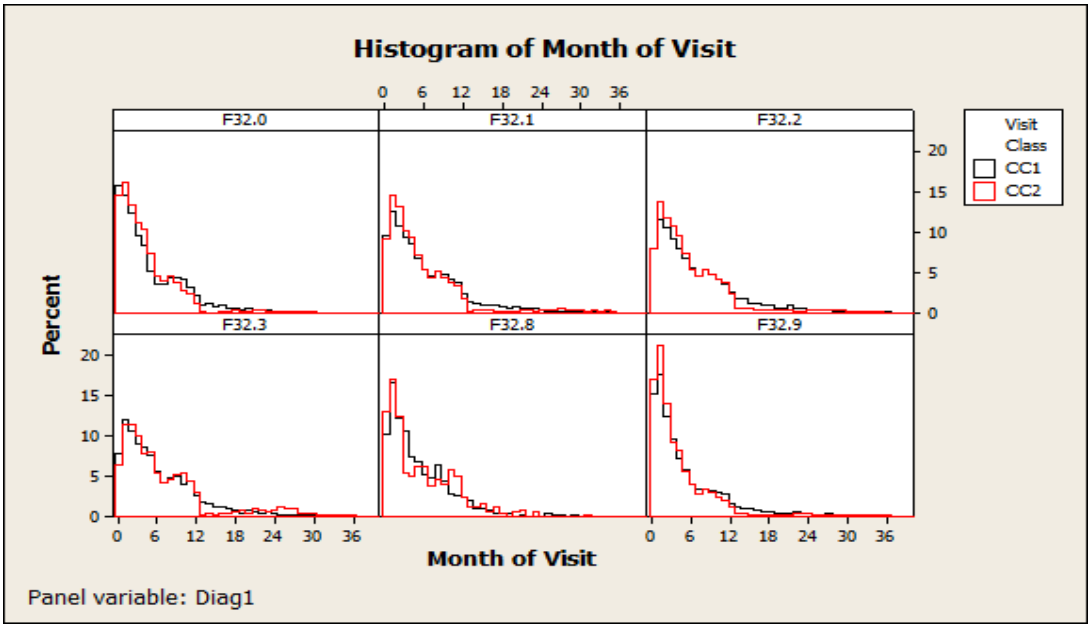

Figure 12 *The proportions of the two cost classes are very similar*

There seems to be no major differences in cost classes over the duration of treatment. The only notable difference is the fact that after 12 months of treatment, the expensive visits (CC2) end, and patients are mostly treated at the cheaper visits. It is difficult to say whether this difference is significant, yet it cannot be considered a coincidence. This analysis allows us to draw out several conclusions:

- costs per visit are the main determinant of total costs (with phone calls, letters and consults only comprising 2.1% of total services)
- treatment in cheap clinics lasts slightly longer than in the expensive ones
- the proportional amounts of cheap and expensive visits vary in the same way for each diagnosis
- the cost class suggests a given procedure to a slight degree
- the notch in CC2 at 12 months suggests that that particular type of treatment is virtually dismissed at that stage

These findings, although not very decisive, do show some grouping which can be later used to assess the possibility of splitting patients into groups. The degree of grouping will be later analyzed with references to the professional opinion of a panel of HUS doctors. The major cost classes found above will also be later used as benchmarks to draw out ideal scenarios with standardized +-costs.

Total cost and number of visits

"Total cost" is the variable that shows the total cost of a treatment of a patient. "Number of visits" on the other hand shows the total number of times a patient has visited a clinic during his treatment. As billing is done on a per-visit basis, the total cost is expected to be linearly dependent on the number of visits. Essentially, a high degree of linearity would suggest a low importance of the actual cost per visit. The following scatter plot shows just that:

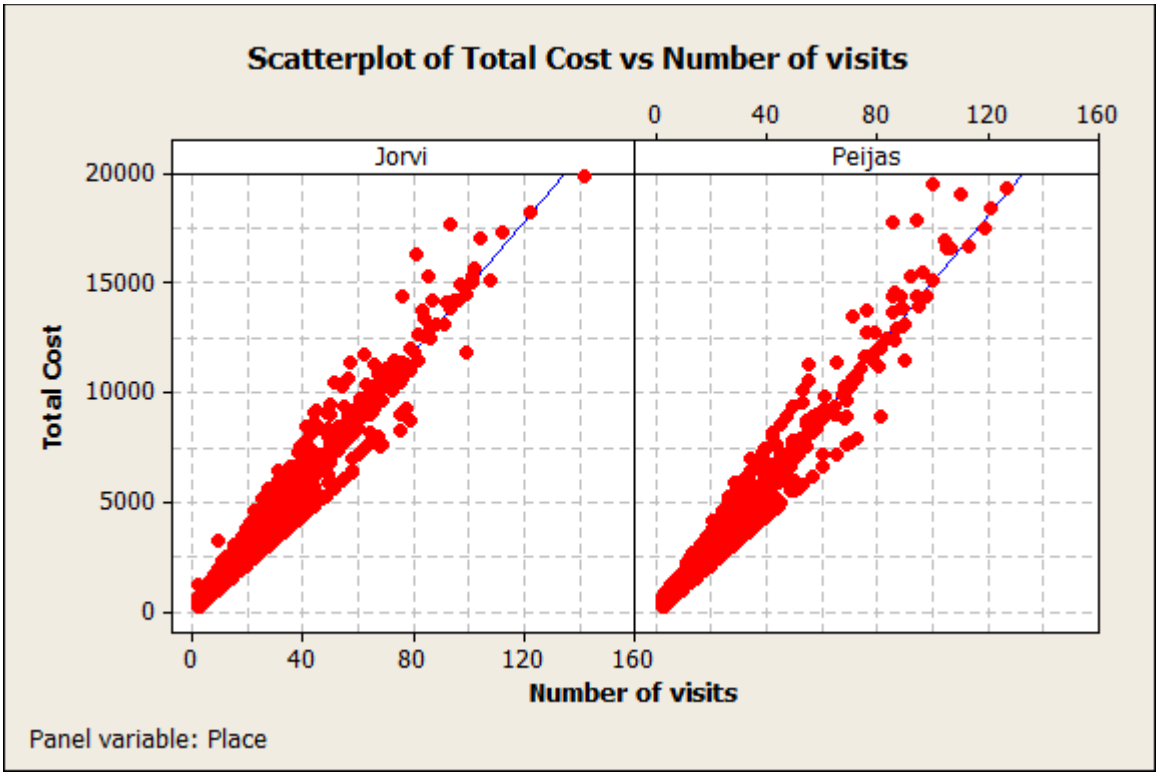

Figure 13The linear relationship between total cost and the number of visits

The line of best fit shows that the average cost per visit in Jorvi is 149€, whereas in Peijas it is 151€. The lines are linear which shows that the total cost is indeed determined by the number of visits. Assuming the cot per visit should ideally be always the same, for further calculations in this study the number of visits can be considered equivalent to the total cost. It should be noted however, that the variance in total costs is quite significant, with the gradients of most expensive vs. the least expensive visits in the above graphs ranging from 190€ per visit to 110€ per visit. The issue behind a cost of per visit is thus in practice of vital importance for the total cost of a patient's treatment.

At this stage the distribution of observations should also be noted. They carry no implications to the analyses of this study, but they might be of general interest. Below is a histogram of the number of visits to each hospital arranged by years:

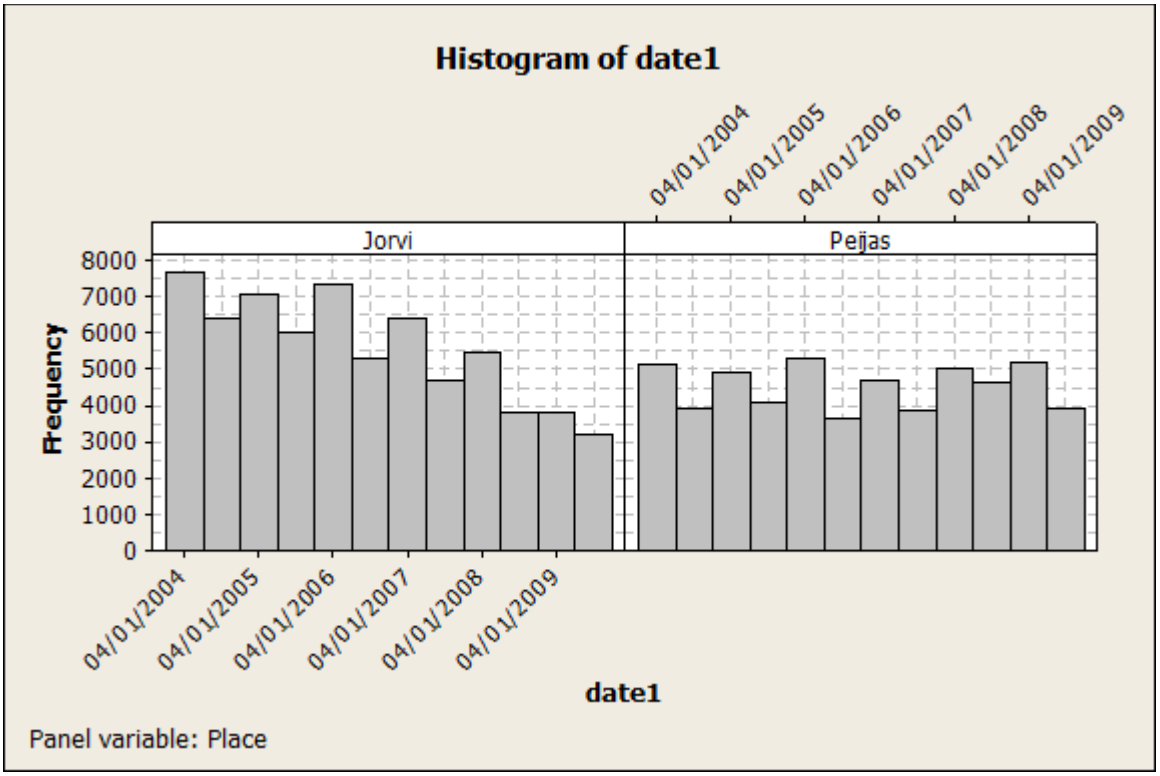

Figure 14 *The number of visits to Jorvi has been decreaseing but has remained fairly level in Peijas*

Two facts strike out from this graph: the number of visits to Jorvi is declining while remaining level in Peijas. The reason for the decline in number of Jorvi is likely to have an underlying cause such as restructuring of units. The number of visits to Jorvi has decreased from 7700 in the first half of 2004 to just 3830 visits in the start of 2009. Peijas on the other hand had 5200 visits 5240 visits at those times. This observation, although not serving a distinct purpose in the current thesis, is overall peculiar to say the least.

What comes to the number of visits for individuals patients, they follow an exponential distribution (with patients with two or three visits as the exceptions). There are no apparent peaks or clusters of visit numbers – the distribution appears virtually continuous. This suggests that the treatment does not follow any guideline specifications as to the number of visits that a patient should have over the course of their treatment. Rather, the patients' treatment is ended at any point when their condition is considered to no longer require specialized healthcare (unfortunately the clinical health assessment data is insufficient so say whether this stage is determined by some standard, e.g. a given GAS score, or by the personnel's best judgment). The following diagram shows the distribution of the number of visits across different diagnoses:

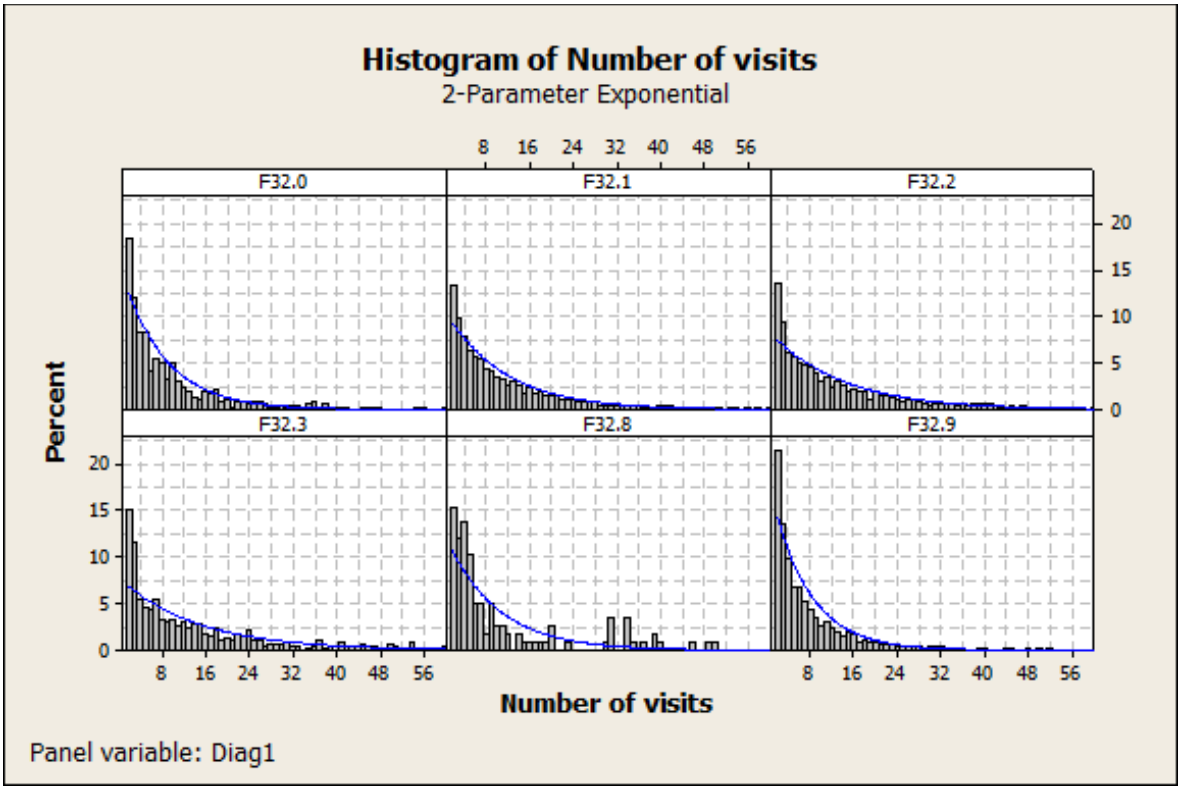

Figure 15 *The distribution of the number of visits is relatively smooth*

The number of visits follow the same distribution for each diagnosis, yet the curvature is rather different depending on the diagnosis – i.e. severity of the depressive episode. The apparent conclusion seems to be that the more severe an episode is, the greater the number of visits, which makes a lot of sense in practice. The peaks in the number of visits for F32.8 seems interesting at first, but their sample consists of only 117 observations (just over a percent of the total) which makes them vulnerable to randomness. The means, medians and standard deviations of the number of visits by diagnosis group are presented below:

Diagnosis	Mean	Median	Standard Deviation
F32.0	9.98	6	10.66
F32.1	12.83	8	14.90
F32.2	15.39	9	17.86
F32.3	16.46	9	20.73
F32.8	11.27	5	12.76
F32.9	8.91	5	10.91

There is no significant in difference when the different places of treatment are considered. With the proportion of diagnoses almost the same in each hospital (suggesting no cultural bias in diagnostics), the following table of means and medians for each diagnosis split according to the place, shows the similarities:

Diagnosis	Jorvi (mean)	Peijas (mean)	Jorvi (median)	Peijas (median)
F32.0	9.91	10.07	6	7
F32.1	12.74	12.94	8	8
F32.2	15.58	15.16	9	9
F32.3	16.39	16.53	9	9
F32.8	12.97	9.49	6	4
F32.9	8.53	9.38	5	5

The above information which points out the fact that the numbers of visits for each hospital are very similar (a virtually identical distribution) can be further shown on a histogram of number of visits by place of treatment:

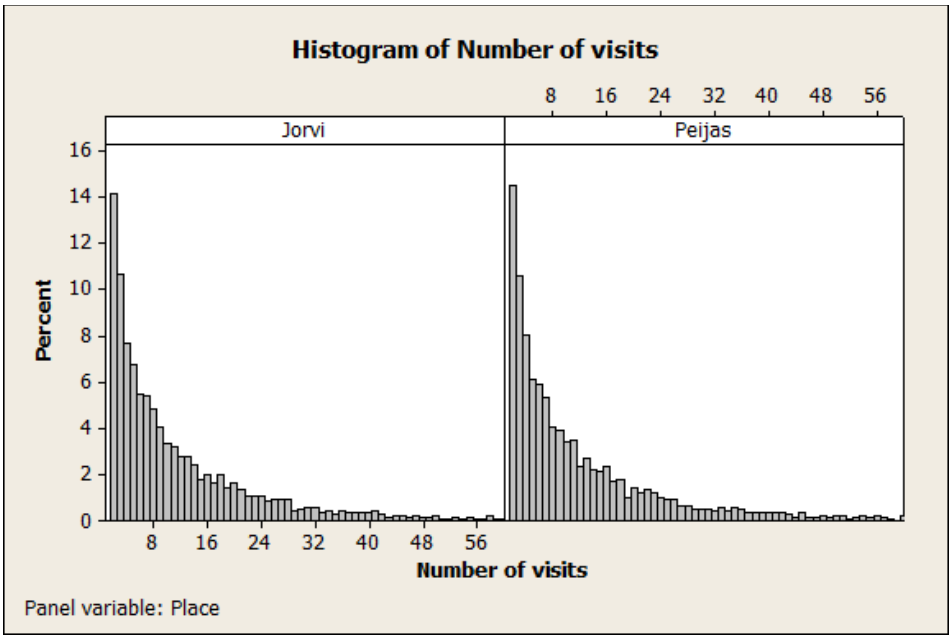

Figure 16 *The distribution of number of visits per patient is virtually identical for Peijas and Jorvi*

Finally, the number of visits (and hence ideally the total costs) of treatments were plotted on a cumulative density function graph to show the number of visits required to achieve a symptomless state for the patients. Below are two charts with reference lines drawn at 66% in the former and 90% in the latter (these percentages were selected randomly just to get a general view of the situation):

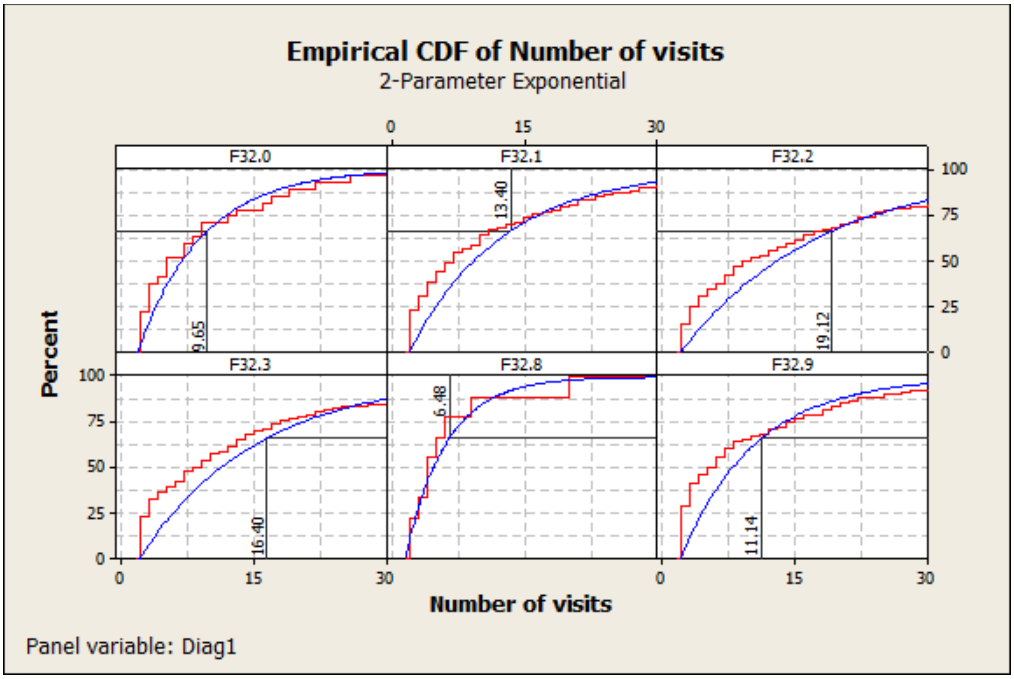

Figure 17 *The number of visits required for remission in 66% of patients grouped by diagnosis*

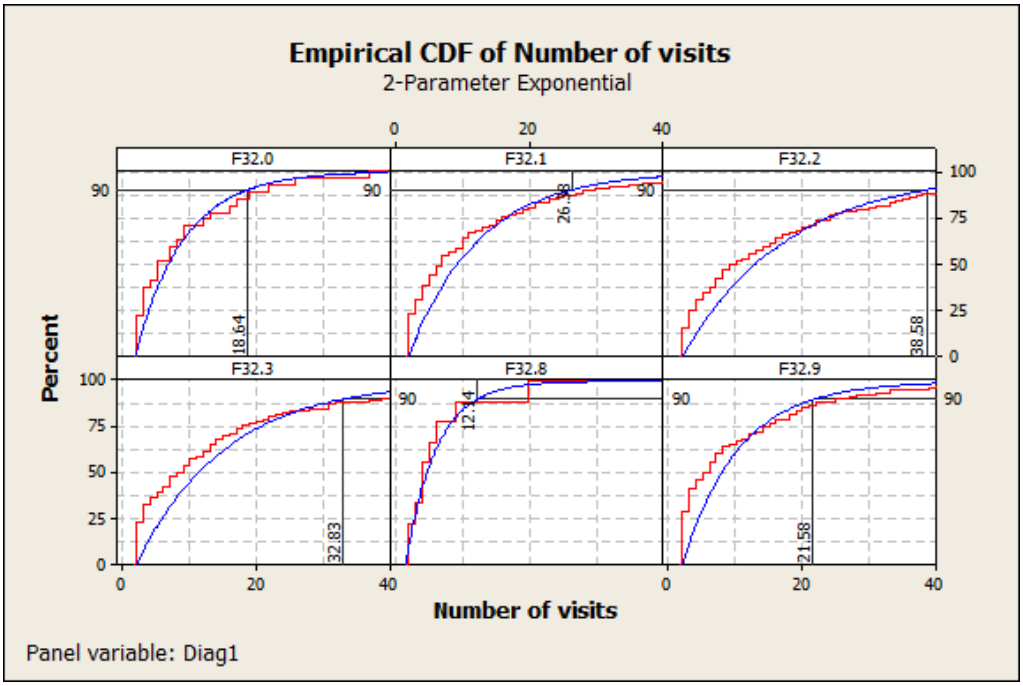

Figure 18*The number of visits required for remission in 90% of patients grouped by diagnosis*

The above results are summarized in the following table, with additional columns added for theoretical standard costs:

Diagnosis	**Number of visits**	**Cost / visit = 110€**	**Cost / visit = 150€**	**Cost / visit = 190€**
66% remission				
F32.0	9.65	1061.5	1447.5	1833.5
F32.1	13.40	1474	2010	2546
F32.2	19.12	2103.2	2868	3632.8
F32.3	16.40	1804	2460	3116
F32.8	6.48	712.8	972	1231.2
F32.9	11.14	1225.4	1671	2116.6
90% remission				
F32.0	18.64	2050.4	2796	3541.6
F32.1	26.38	2901.8	3957	5012.2
F32.2	38.58	4243.8	5787	7330.2
F32.3	32.83	3611.3	4924.5	6237.7
F32.8	12.14	1335.4	1821	2306.6
F32.9	21.58	2373.8	3237	4100.2

The analysis of total costs and the number of visits lead to these major conclusions:

- number of visits and total cost are directly related
- number of visits is (almost continuously) exponentially distributed
- number of visits does not group observations into distinct groups (i.e. packages)

Frequency of visits

This subchapter analyses the frequency of visits by diagnosis and place of treatment. In addition, it points out the time intervals at which visits are most commonly held. The methodology of treatment duration measurement carries an error due to the fact that a patient ID is carried over a number of depressive episodes (whilst not properly differentiated by the different diagnoses of F32 or F33). For example, a patient might come in for a visit or two in 2004, then leave for two years, then come in again for more visits in 2007. This would result in an average time between visits of over 200 or 300 days. These observations are thus overlooked in the analysis.

For the reason mentioned above, considering the full range of frequencies yielded non-interpretable results. But an adjusted sample, with frequencies at less than 90 (i.e. the longest duration between visits considered is 90 days) by diagnoses, looks as follows:

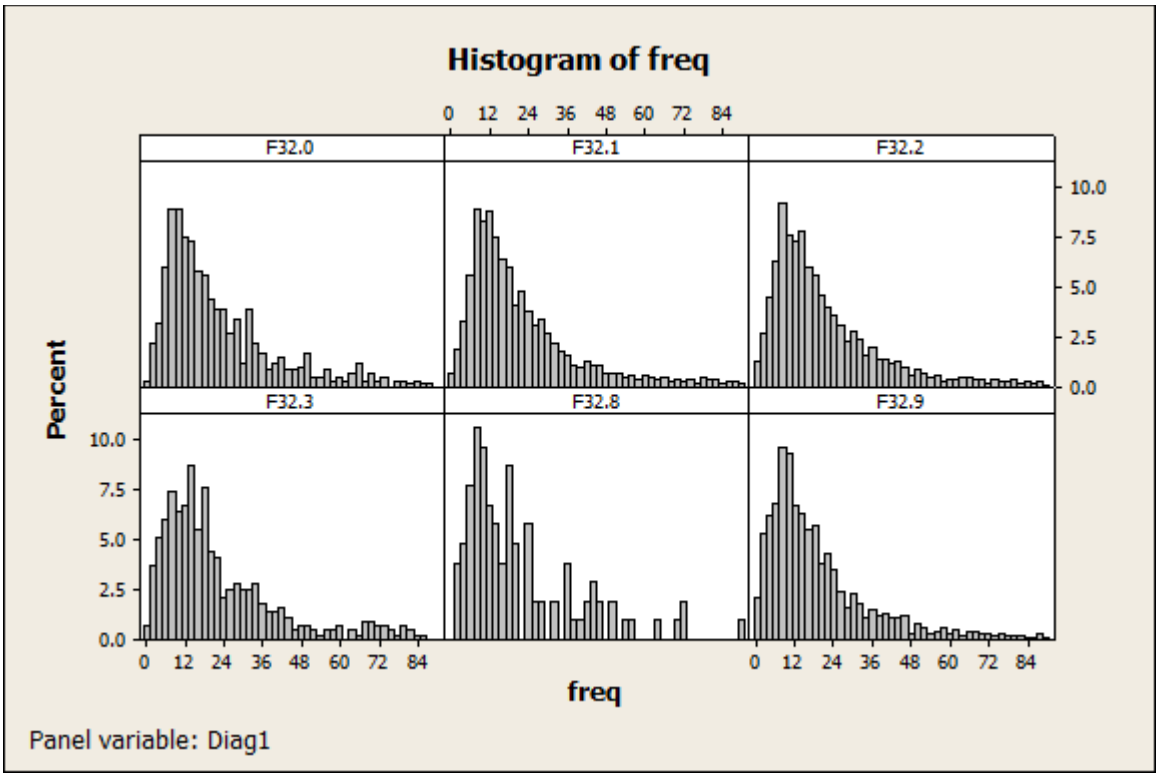

Figure 19 *Distribution of frequencies by diagnosis*

The distribution shows the most common interval between visits to be somewhere between 7 and 14 days. The very slight differences in the shapes of distributions suggest the following:

- patients with F32.3 and F32.8 tend to visit at erratic intervals (their distribution is more levelled)
- visits of patients with "simple diagnoses" of F32.0, F32.1 and F32.2 tend to be more clustered around 7-14 days
- differences in distributions are quite similar to each other and thus little can be said about the implications

However, a much more interesting plot is not that of the aggregate frequency, but rather of the frequency up to a given point in treatment. In other words how often do patients of given diagnosis groups visit the clinic during their first month, the first two months, and the first three months of their treatment. This data is presented in the three histograms below:

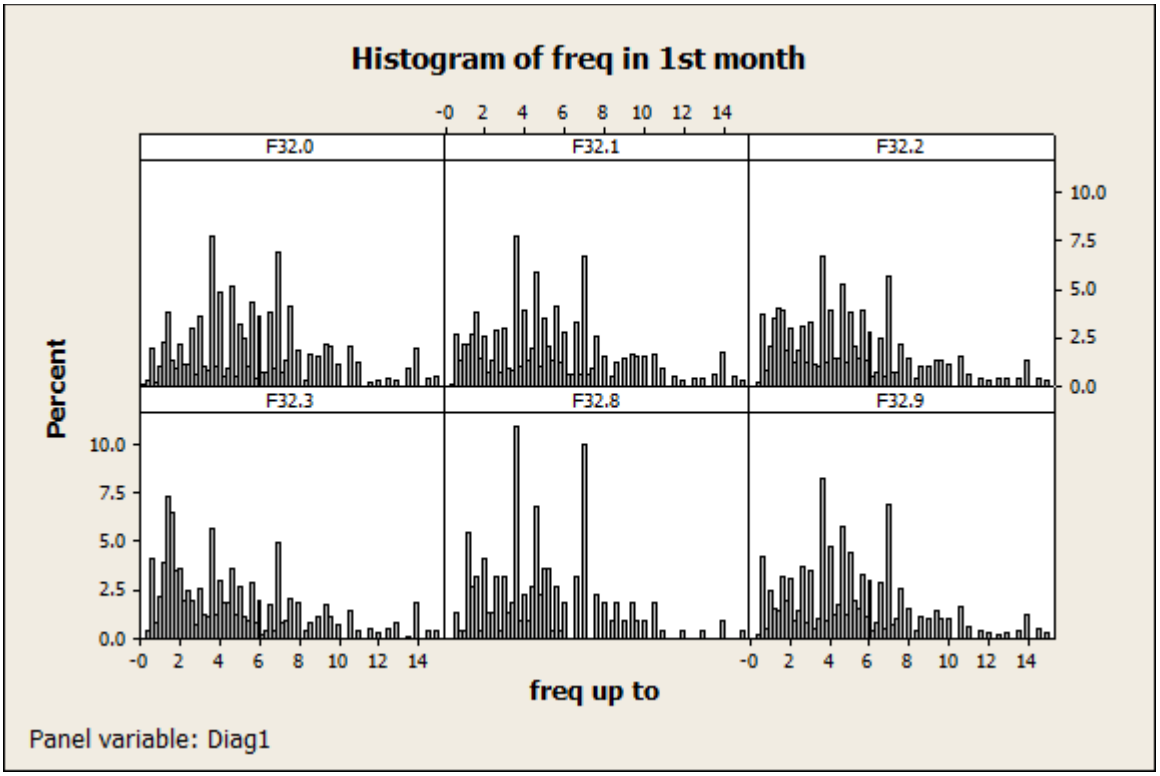

Figure 20 *Frequency of visits during the first month of treatment by diagnoses*

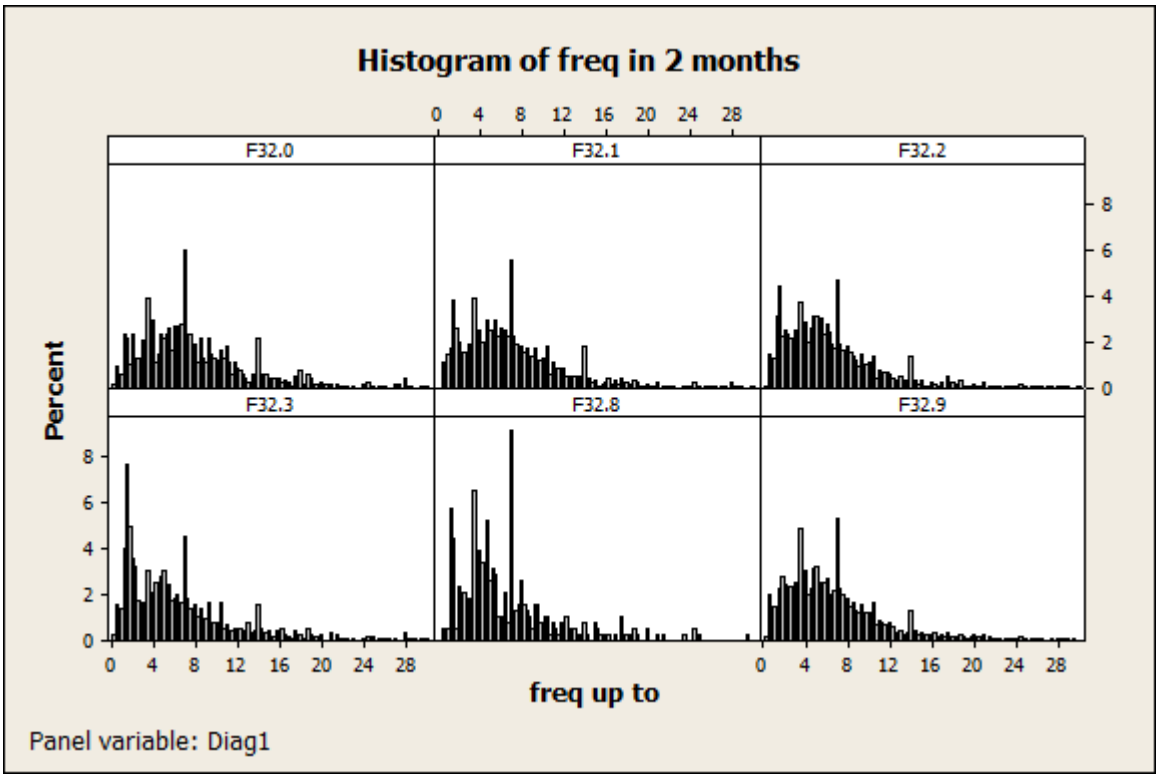

Figure 21 *Frequency of visits during the first two months of treatment by diagnoses*

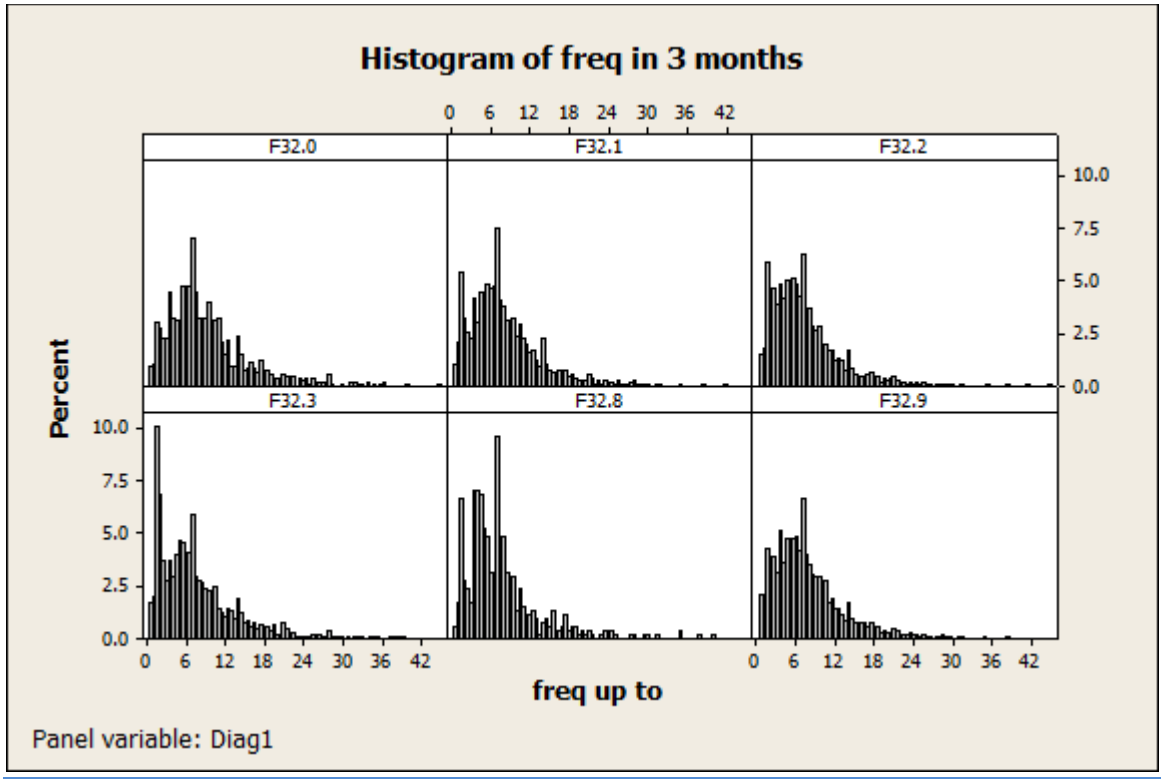

Figure 22 *Frequency of visits during the first three months of treatment by diagnoses*

A point of note in the above graphs is that the distribution appears somewhat smooth due to the fact that the frequencies are being constantly varied. For example, referring to the first graph: a patient would visit three times in the first week, twice in the second week, and once more in the third and fourth week of the first month. The average frequency for the first month would hence turn out to be 30 / 7 = 4.29. These observations comprise the smooth curve underneath the distinct peaks. The peaks on the other hand represent the patient visits with set visiting periods. The following table summarizes the position of the highest peak (or peaks where almost equal) for each period – e.g. peak at 3.5 means that a patient has had a visit twice a week:

	1 Month	**2 Months**	**3 Months**	**Explanation**
F32.0	3.5, 7	7	7	Once a week
F32.1	3.5, 7	7	7	Once a week
F32.2	3.5, 7	1.5, 7	1.5, 7	1-3 times a week
F32.3	1.5	1.5	1.5	3 times a week
F32.8	3.5, 7	7	7	Once a week
F32.9	3.5, 7	3.5, 7	7	1-2 times a week

The above analysis shows some interesting facts of the frequencies of treatment that can be summed up as follows:

- the more severe an episode, the more variance there is in frequencies
- the more severe an episode, the more frequent visits normally are
- visits are more frequent at the start of treatment
- there are distinct peaks at standard week long intervals

It can hence be concluded that the staff's prudence in matters of visit frequency play a vital role in the treatment methods. As the CCG suggests, in cases of severe depression (especially with a change of self-harm), the frequency of visits is ought to be increased. However it should also be noted, that the frequency of visits does not tend to 1 as the period of observation is reduced. In other words, there does not seem to be a period at the start of treatment with very frequent visits where the condition of a patient would be thoroughly investigated (whereas this tendency was expected by the initial theoretical hypothesis).

Inpatient and Outpatient care

The difference between inpatient and outpatient care is a central question in secondary mental health care. Despite the fact that the number of outpatient care visits (and hence their costs) are somewhat equal in Peijas and Jorvi, a simple analysis of total costs shows that these values are quite different for the two locations. Below is a table summarizing some key total cost statistics by place and diagnosis:

Diagnosis	**N of patients**	**% of patients**	**Cost / pat (95% sample)**	**Total inpatient care days**	**Inpatient care days / pat**
Jorvi	*7486*	*100%*	*1407.4*	*13098*	*1.75*
F32.0	496	6.6%	896.6	250	0.50
F32.1	2949	39.4%	1363.5	3281	1.11
F32.2	1868	25.0%	2000.4	4983	2.67
F32.3	438	5.9%	3083	2989	6.82
F32.8	78	1.0%	1424	58	0.74
F32.9	1657	22.1%	791	1537	0.93
Peijas	*6100*	*100%*	*1430*	*11335*	*1.86*
F32.0	433	7.1%	885	549	1.27
F32.1	2282	37.4%	1384.9	2031	0.89
F32.2	1541	25.3%	2041	4342	2.82
F32.3	376	6.2%	3297	3283	8.73
F32.8	78	1.28%	1044	99	1.27
F32.9	1390	22.8%	849.1	1031	0.74

The above table shows Peijas to have slightly more inpatient care days. Although perhaps interesting in the big picture of the progress of psychiatry, for the current study it is of little

applicability. This is because depression tends to have very few visits of inpatient care as opposed to the total sample. In the data of this study, only 1.1% of visits were of inpatient care. Not only does this make the results of minor significance, but suggests that the data might be insufficient. With a simple chart of number of inpatient care days per time, an enormous variance can be seen, which denies the possibility of identifying a pattern or a tendency:

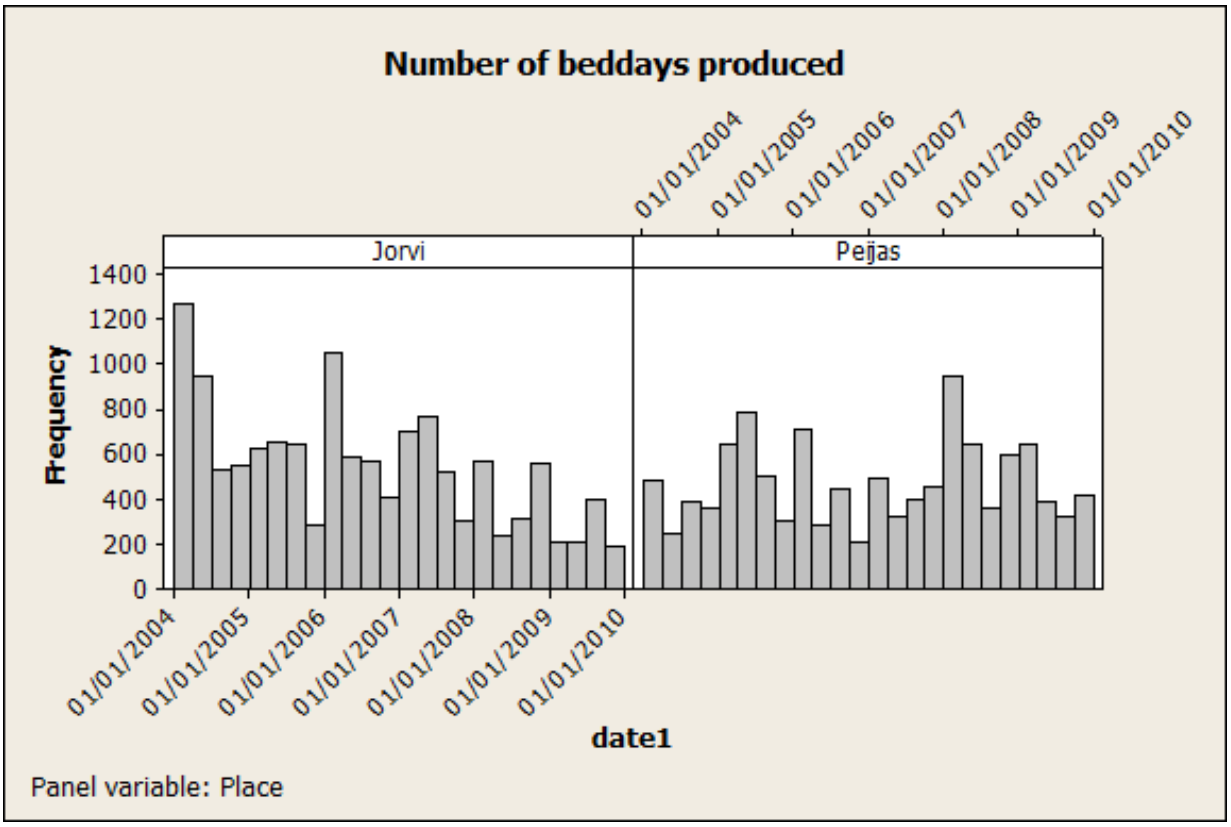

Figure 23 *The number of inpatient care days in each hospital has a high variance*

Duration of treatment

The duration of treatment was expect to be the central variable in determining patient groups and patterns in treatment. This is also the variable that is most explicitly defined in the CCG, who state the expected remission rates in terms of the duration of treatment, not in terms of the variables discussed previously. As we have seen, the number of visits is subject to change depending on the staff's perception of the severity of the condition of a patient; it is not tied to the effectiveness of a treatment method. In other words, remission is expected to occur after a given number of days of treatment (depending on the treatment used: drugs, and/or therapy), not after a given number of visits. The duration of treatment is hence the most promising

variable for finding patterns and hence the possible future division of depression patients into distinct groups. Theoretically, there should be distinct peaks at times when treatment has been effective for a significant proportion of the sample. The peaks would be but means of distributions around whom the probable observations should be arranged (since e.g. drug treatment does not have an effect at exactly 60 days for everyone). Below is a histogram of treatment durations:

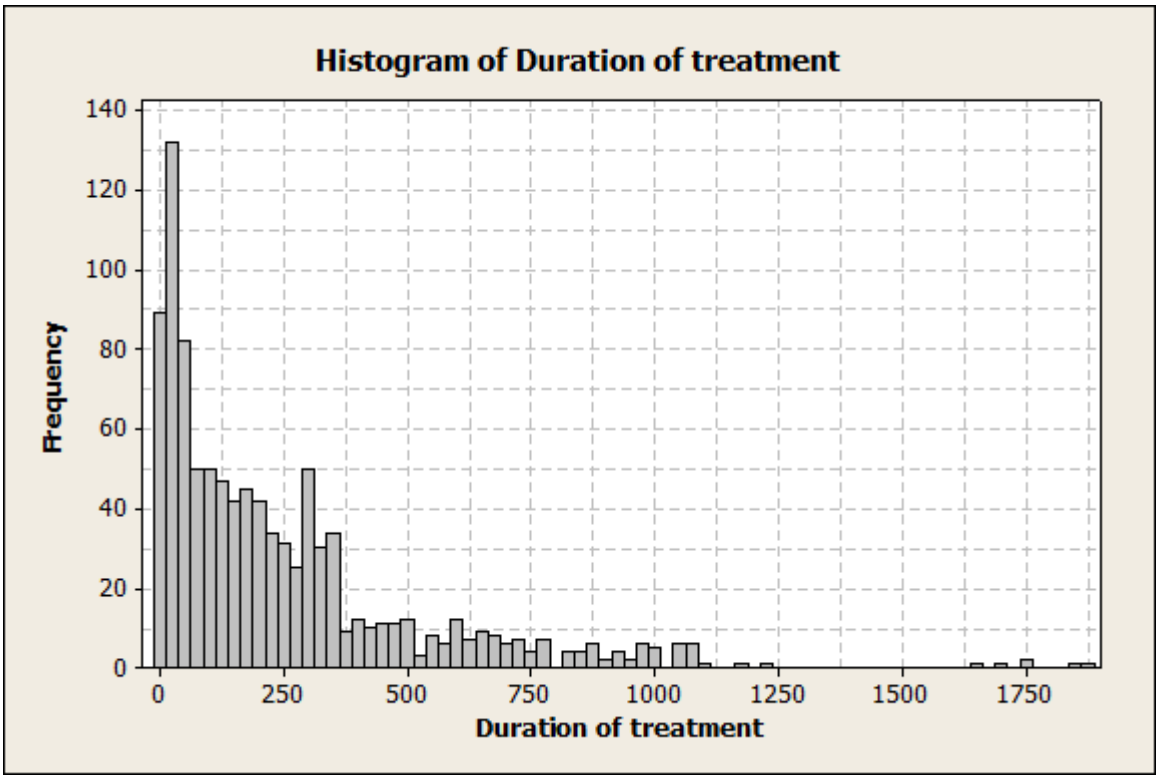

Figure 24 *Duration of treatment for all diagnoses and both hospitals*

The graph shows a crude division into groups as follows:

- up to 60 days (2 months)
- up to 300 days (10 months)
- up to 1110 days (3 years)
- 0 days, a group of patients with only 1 visit are excluded from the above graph

The graph also shows a number of observations at over 1500 days. Those will be from now on discarded as either outliers or erroneous observations (due to the way in which durations were calculated: time from first to last visit). Also, it should be noted again, that the observations are biased towards the shorter ones. This means that the skew of true duration treatments would be more gradual.

When split into places of treatment, the same graph looks as follows:

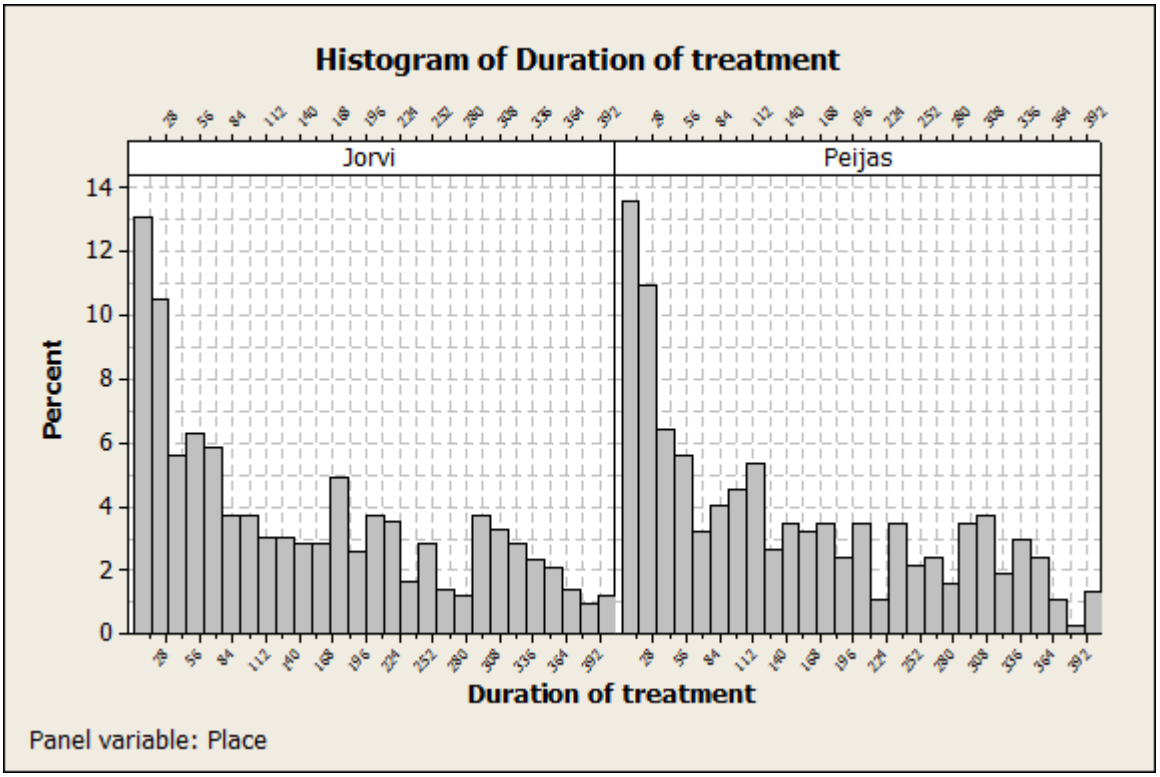

Figure 25 *Durations of treatment split by place of treatment shows minor differences*

Although the shapes are somewhat similar, peaks at 24, 28 and 32 weeks seem to be distinctive for Jorvi, and clusters of peaks at 12-18 and 22-28 weeks for Peijas. Although unlikely, this could mean that thanks to a difference in treatment methods, patients respond to treatment at those particular stages. It is more likely however, that the evaluation of treatment culture is different in the two hospitals. i.e. Jorvi evaluates (and aims to end treatment) the patients at 4 week intervals whereas Peijas does so more regularly. The most likely explanation is however coincidence.

When the same graph is plotted while divided by diagnoses, the groups become even more apparent still:

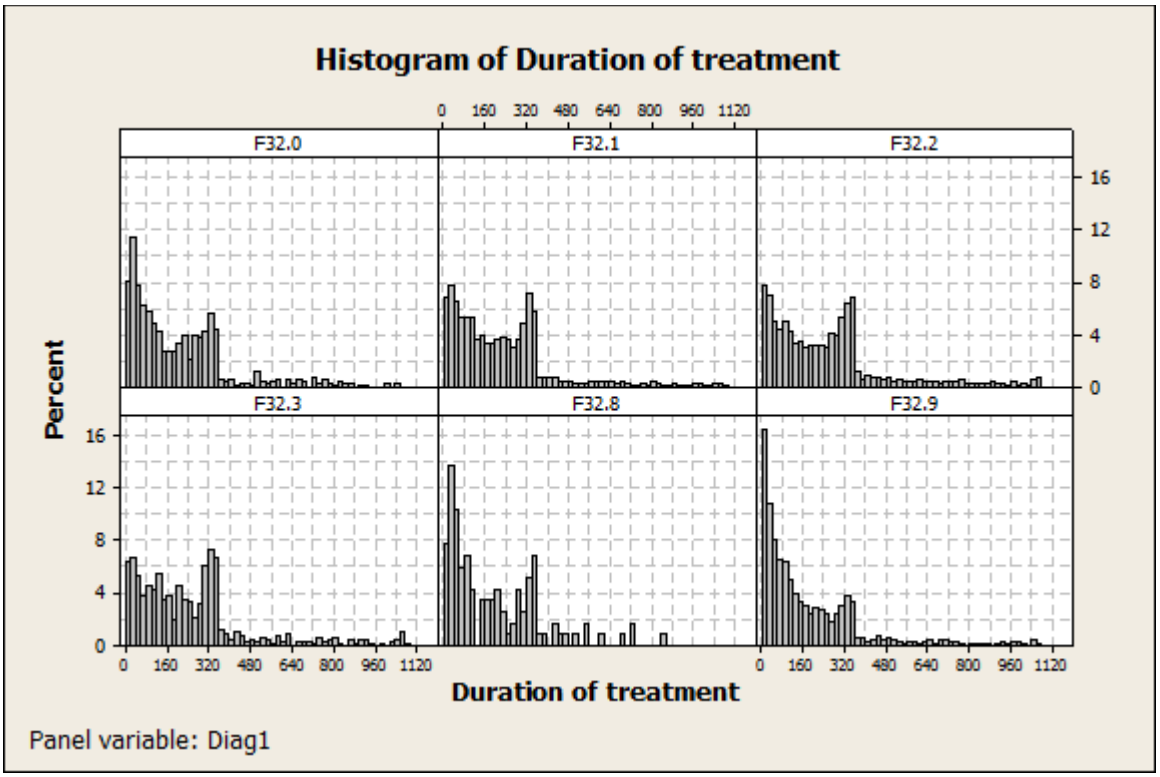

Figure 26 *The duration of treatment by diagnosis shows a distinct pattern*

There are some differences in durations by diagnosis. Again, the more severe the episode, the longer the duration is likely to be. The shape of the distributions can be summarized as follows:

- a distinct peak at 14-30 days (peak1)
- a distinct peak at 330-350 days (peak2)
- decrease in frequency during 30-200 days (decrease1)
- increase in frequency for 200-350 days (decrease2)
- a sharp drop in frequency after 350 days (drop1)
- a plateau of durations for 350-1100 days (plateau1)

Unfortunately there is no readily available data to explain the underlying reason for these groups. Although the patterns do alter by diagnosis, that is by no means the determining factor. It can be also seen that the place of treatment was not the reason either. It has also been

shown before that the frequency of visits does not appear to be divided into groups. The fact that frequency is not grouped but durations are, suggests that frequency is not likely to be the factor in the durations of treatments either. Finally, gender nor age appeared to have a connection to the duration.

According to the CCG there are essentially two types of effective treatment: drugs or therapy (or their combination). If this data was available for the study, the following scenario (the actual underlying reasons might be different) for an apparent explanation for this shape could be claimed with more certainty:

- a group of patients only undergoes assessment or a short intervention and then leaves the system (peak1)
- for another group of people drug and therapy treatment: whether effective or not, they are removed from the system (peak2)
- a group of patients is kept on for follow-up or other treatment attempts (plateau1)

Since the underlying reason cannot be determined by the data, a proper distinction of distributions cannot be drawn either. If this was not the case however, the distributions could well look like this:

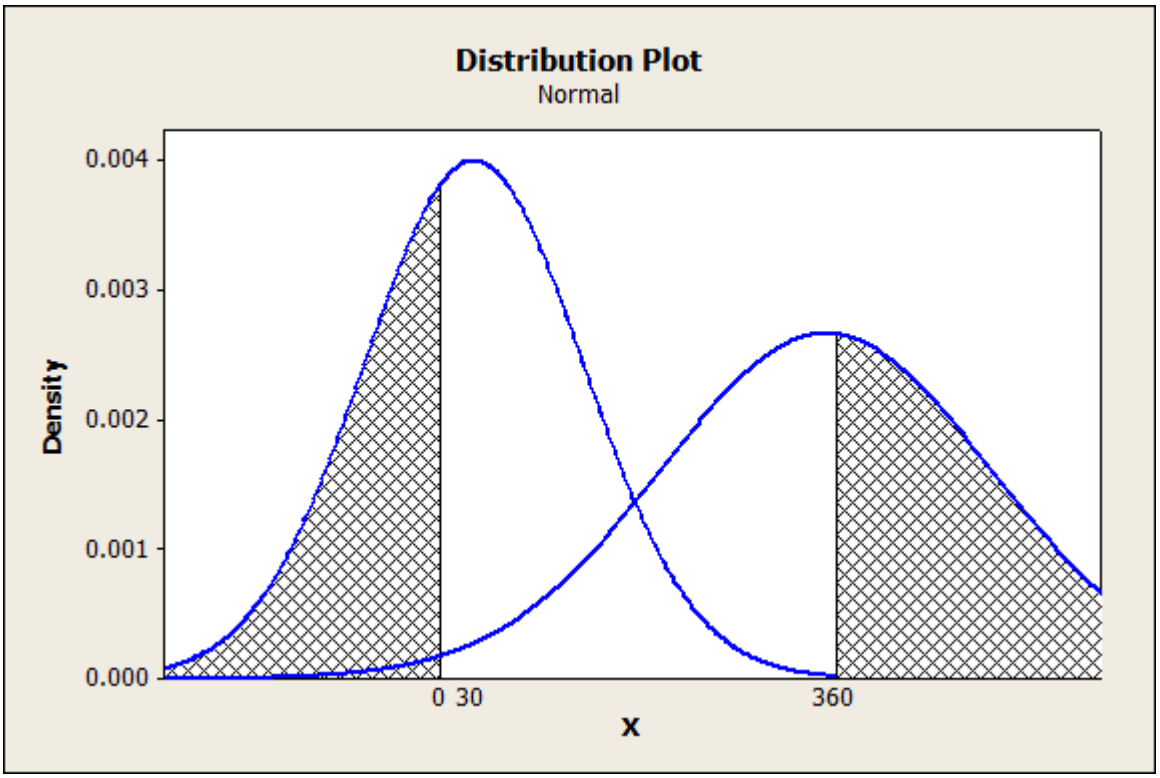

Figure 27*A possible group of distributions by treatment method (e.g. short treatment or assessment, therapy + drugs)*

The above graph is not to scale, it simply illustrates the idea of several distributions (with distinct underlying reasons, such as treatment methods) comprising a total that resembles the graph from before. The shaded region at 0 represents that negative treatment durations and the shaded region on the right represents the sudden drop in durations at approx. 350 days.

The distinct notch at 350 days strongly suggests an adherence of treatment culture to the idea that treatment beyond that point is essentially inefficient according to the CCG. Patients thus tend to be discarded from the system after that point. However it should be noted that some 13% of all patients do carry treatment for over 350 days. This on the other hand corresponds to just over 28% of the total costs for the patients with more than 1 visit. It should also be said that the plateau does not consist of patients with rare visits, as seen on the following marginal plot:

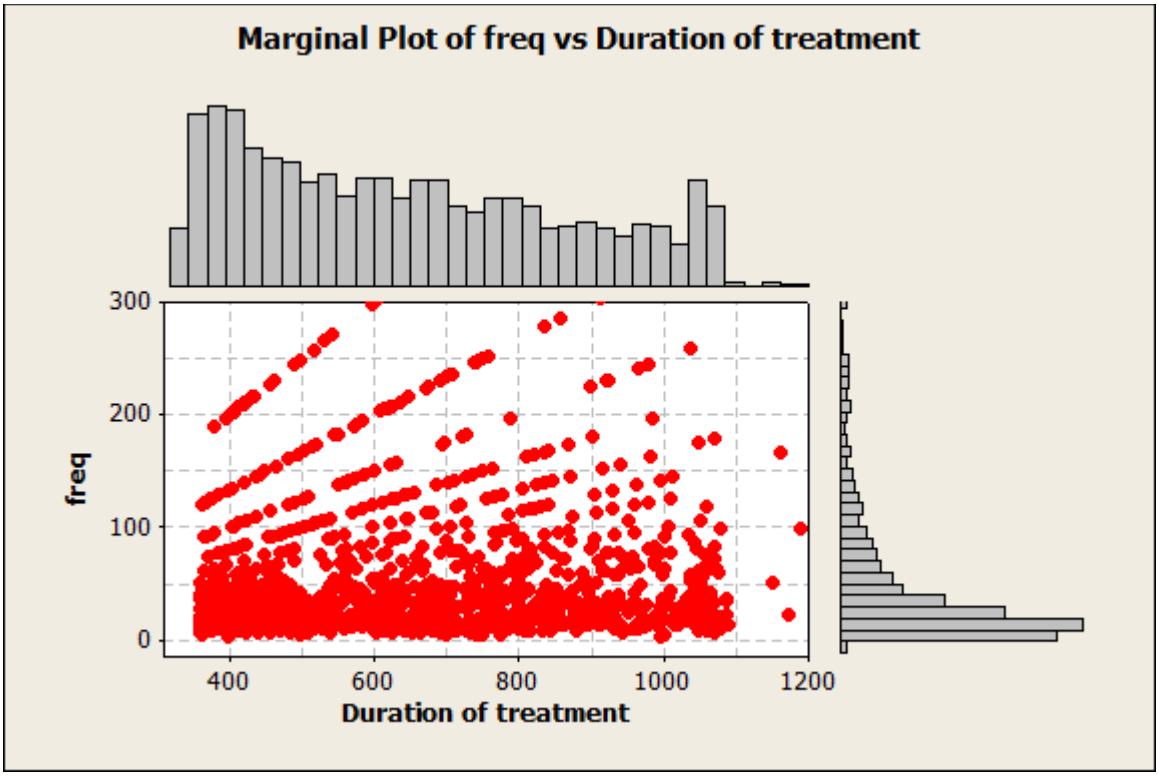

Figure 28 *The plateau patients consist mostly of those visiting at least once a month*

The above analyses do carry two known (but indistinguishable) errors: the aforementioned bias towards short periods and patients who did not finish the treatment plan. If the bias was corrected, the durations from the early peaks would be redistributed along the graph towards the longer ones. The patients who ended their treatment on the other hand create noise for the distribution. It is impossible to determine their proportion but they are likely to be somewhat evenly distributed along the histogram. If they were accounted for, the peaks in the

distributions would become proportionally greater and hence even more apparent. In other words, these two error factors distort the data to make the conclusions less apparent. But since it is known that they exist, it could be claimed that the real distinction of patient groups is even more significant and apparent. In other words, the groups are "at least this distinct" (as visible on the above graphs).

Despite the absence of the concept of a treatment package in outpatient care in psychiatry, the investigation of durations of treatments appears to suggest that there are still quite distinct groups in terms of durations. What the underlying reasons are, is difficult to say without additional data. It can also be said that there is a degree of adherence to the CCG. Rather, it can be said that the CCG holds in practice. In other words, it is unknown whether the groups exist due to the staff's attempts to follow the CCG, or the CCG is based on similar empirical evidence that follows distributions as above.

Discussion of Findings

The study aims at identifying treatment patterns in the outpatient care of depression at HUS. The critical variable that appeared to reveal patient groups was found to be the duration of treatment. Although the underlying cause of the groups was not apparent from the data used, the likely causes seem to correlate with the CCG to a significant degree. The visiting costs, the number of visits and the frequencies on the other hand showed a continuous distribution thus exhibiting no grouping and thus do not serve the immediate aim of the study but contribute to the general understanding of the field. This final chapter goes through the findings – first those that turned out to answer some questions posed by the aims, and then those that are interesting for the understanding of the big picture.

Patient groups – theory and practice

The most important finding of the study is the identification of patient groups by the duration of treatment. Although the data is distorted the patterns of treatment duration are apparent. In addition to patient groups being distinctly visible, they can be tied to the theoretical treatment framework that is the CCG. The groups of the 12332 (those who only had outpatient care) patients who were considered in the analysis t can be summarized as follows:

- Patients with a single visit
- Patients with duration of 0-30 days
- Patients with duration of 330-350 days
- Patients with duration 350-1100 days

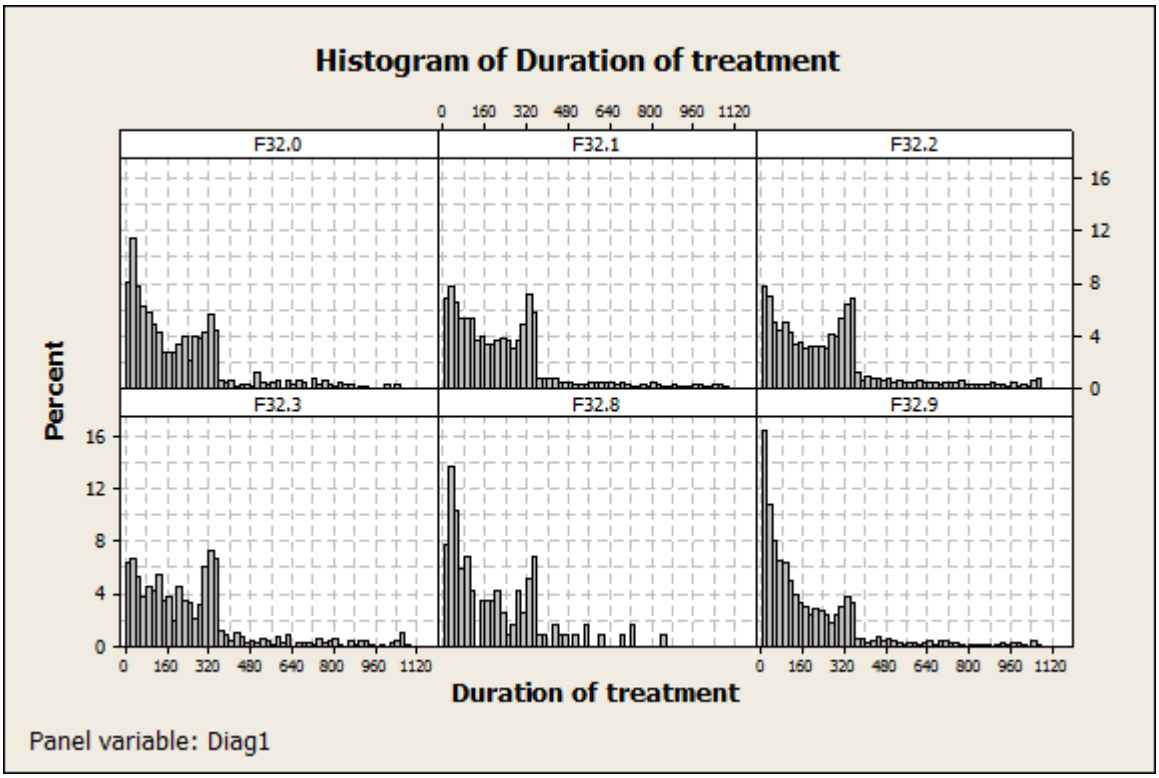

Figure 29 *Grouping was apparent in the durations of treatment by diagnosis*

If underlying reasons were found in further studies, and if they would confirm the assumption that the apparent division into groups is caused by treatment methods, the grouping could be something like this:

Group 1: "A single visit to a psychiatrist for evaluation"

Group 2: "A short drug treatment of depression"

Group 3: "A long treatment of depression with drugs and therapy"

Group 4 should be excluded from treatment as the CCG suggests it is ineffective

The average costs for these groups would then be counted and patients billed accordingly, as their treatment progresses to the following stage. Determining the shapes of the curves and thus the averages poses a problem at the moment, since the data did not include information

of treatment type. An attempt to figure out the treatment type based on cost levels proved unfruitful. This is thus left for future studies of the topic.

The number of patients with a single visit comprise a significant proportion of the sample. With 3310 observations, their share of the total is 26.8%. This is by far the greatest individual group in the sample. In terms of the CCG and the "general consensus" framework they are those who entered the system for an initial visit and were deemed not suiting for the secondary health care of depression. The reasons for this decision include another diagnosis or a mild case of depression.

The proportional size of the other peaks is a lot less precise, in fact it is somewhat speculative. Nonetheless, if the assumption of a fit of two cut (as explained above) normal distributions holds, they would equal the area under the curves of the distributions where each curve would correspond to a particular method of treatment:

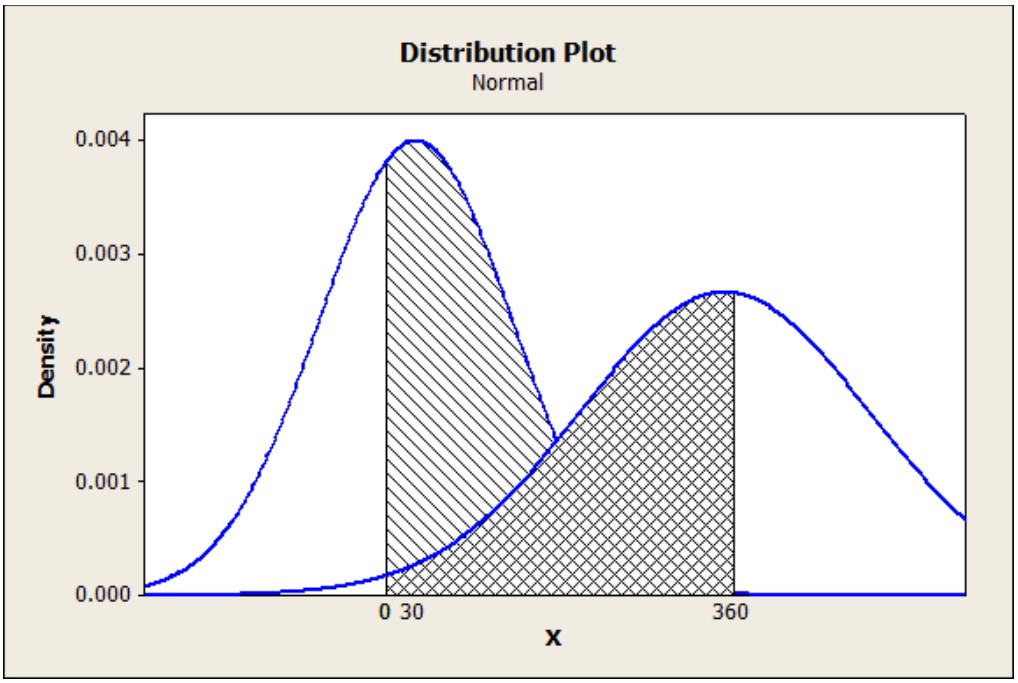

Figure 30 ***A possible fit of two normal distributions***

However, based on the data available to this study it is all but impossible to even make estimates of these areas. This is due to the two errors that have been discussed at length before, as well as to the actual causes (since treatment type data was not available) of the distributions. In a graphical representations the two errors can be shown as follows:

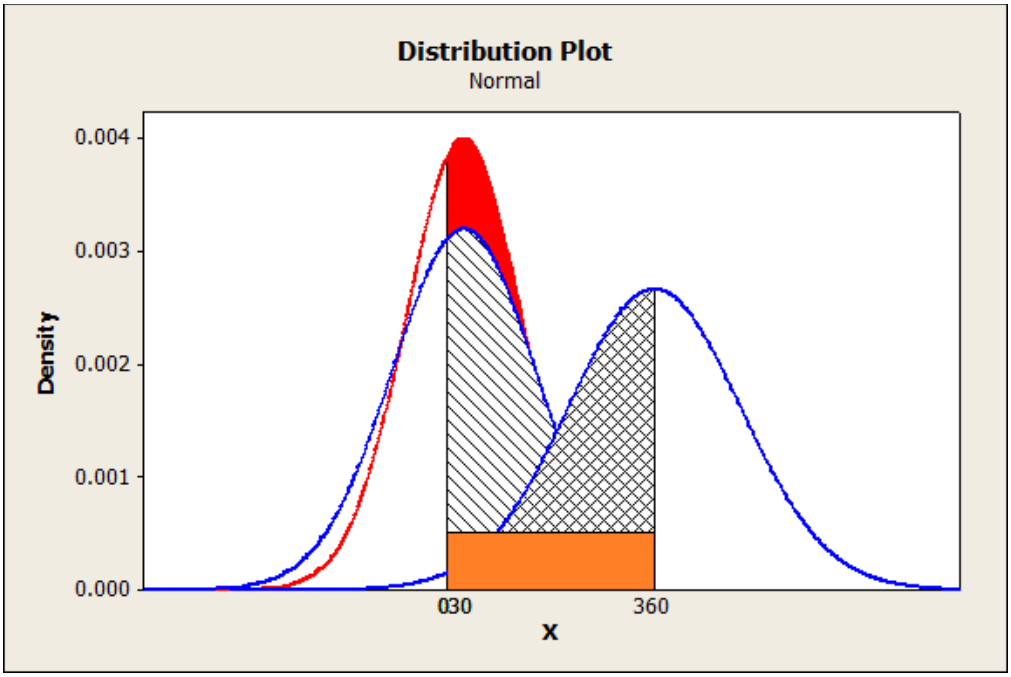

Figure 31 *The two major errors in the data*

Packaging has been seen to increase motivation, efficiency and data quality. In terms of the durations, there should be two significant benefits: degree of number of drop outs should decrease since patients would be motivated to stay for the whole paid duration (the peaks in the distribution would be steeper, while the plateau between them would be shallower) and the excessively long treatment periods would decrease (the long tail after 350 days) since the maximum duration package would abide the CCG.

The reduction of drop outs (i.e. the increase of completed treatment periods) would likely improve the overall output of mental health care in terms of clinical metrics. This is due to the fact (as strongly suggested by the CCG) that a completed treatment period is significantly more effective at treating the depressive episode and preventing its reoccurrence.

The reduction of the patients in the tail of the distribution is particularly significant in terms of cost savings. The cumulative total cost for patients with more than one visit is €16,945,000. The cost of those with less than 360 days of treatment is €11,982,000. This means that the patients in excessive care account for some 29,4% of cumulative costs while comprising only 13% of the sample. The following histogram shows the cumulative costs, where the notch at 360 days is clearly visible:

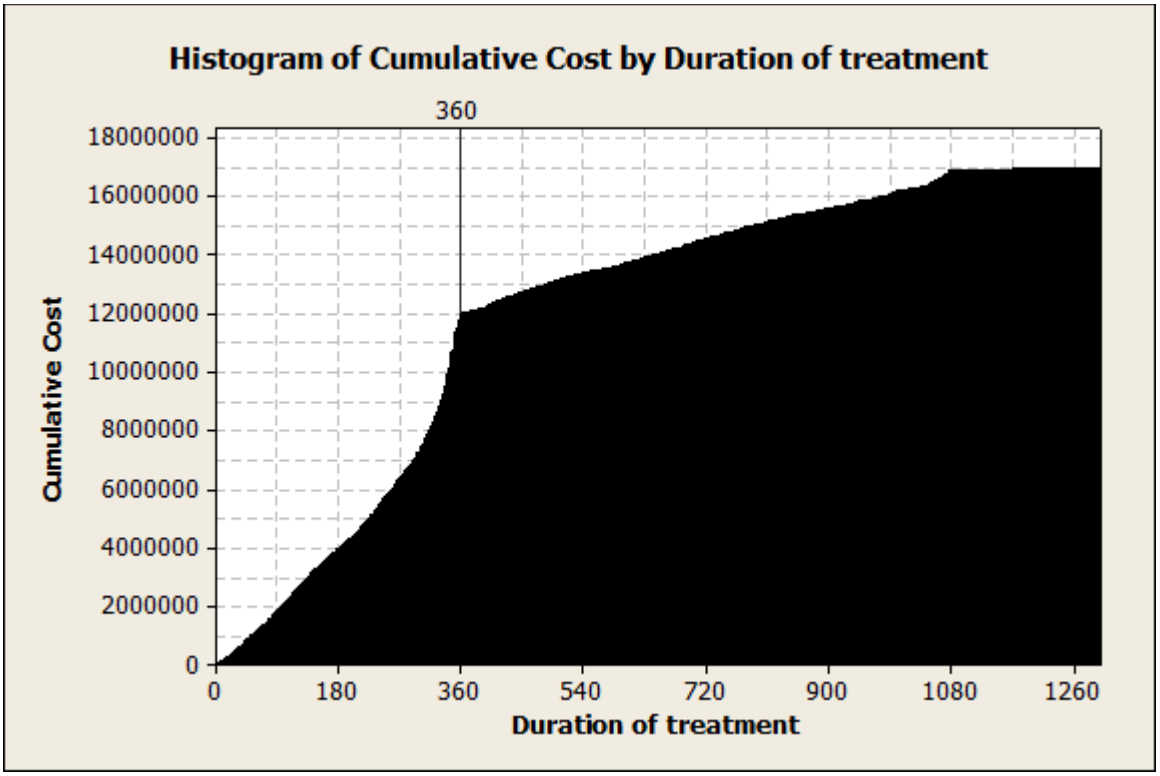

Figure 32 *The cumulative costs of outpatient visits in terms of duration of treatment*

It is naïve to assume that the introduction of packaging would completely eliminate treatment durations of over 360 days; it might be both impractical or even harmful to the patients. However it would certainly affect this tendency to some degree as patients would be treated for more than 360 days only in exceptions. These exceptions would be the cases when a doctor strongly believes that something can still be done for the patient in secondary health care, although the CCG suggest otherwise. Even so, these cases would be billed according to the traditional method, not by the packaged prices, as they would outliers in the analysis of the mean cost.

Summary of practical findings

Data analysis and the assessment of its quality reveal a number of interesting and practical findings that turned out to be curiosities rather than serve the final aim of this study. These include facts about the database, the quality of records, tendencies in total costs and visits as well as frequencies of visits.

The overall quality of the database is rather deficient. This can be explained by the major fact that the database is generally meant for other treatment cultures (i.e. one with packaging, as successfully done in somatics) and the lack of recording incentives in the current culture. As said, treatment packages do not exist in psychiatry. Therefore the fields that refer to packaging factors are not actually even meant to be filled in. For example, since there is no such thing "a treatment package for F32.1 depression with drugs", there is no reason to mark a patient's first visit as the first visit – it would not serve any purpose for billing, treatment planning or quality analysis. However, if packaging was implemented in psychiatry, it would create this incentive making quality and efficiency analyses (and hence internal reporting) a lot easier. This culture has been implemented in somatics and the results have been tremendous – quality of records has increased steadily.

Total cost and the number of visits appear to have no grouping qualities. The distribution of each showed a continuous distribution which suggest they are not bound to a specific patient type or treatment method. However, they did prove the somewhat apparent assumption that more severe diagnoses require more visits (and hence cost more). It was also shown that these variables exhibit linear dependency and are thus virtually equivalent. There is however considerable variations in visit costs, even though they are ought to be standardized by visit type. The quality of records for visit types appears to be deficient; over 80% of all visits are "other visits". This makes classification and quality analysis challenging to say the least. To counter this apparent flaw, an attempt was made to classify visits by their cost groups. Although the grouping worked (the levels of cost groups were quite uniform), this turned out not to be useful in finding patterns in treatment. In other words, although the idea of cost classes worked, the classes turned out to be arbitrary and not bound to a treatment method.

Another interesting finding in the analysis of the number of visits was the fact that overall they have decreased in Jorvi while remaining somewhat level in Peijas. This is very surprising considering the fact that Jorvi is responsible for the treatment of about one and a half times the population of Peijas. There must be an underlying reason for this finding, but finding it is omitted in this paper as it is of little significance to the aim. The distributions of the number of visits per patients were very similar if not identical. This suggests that there is no considerable difference in treatment cultures between the two in terms of the number (nor frequency) of visits.

The analysis of frequencies of visits for different time periods and diagnoses showed some interesting facts. Firstly, the frequencies again depend on the severity of the condition; the more severe, the more frequent the visits. Secondly, although there is a smooth component to the frequency distribution (i.e. periods between visits vary), there is also a significant degree of adherence to the calendar. In other words visits once a week are significantly more likely than once in 6 days. This is natural for practical reasons but might to some degree interfere with optimal treatment. Thirdly, the frequency of visits does decrease as time passes. i.e. visits are more frequent in the first month than during the first two or three months. Finally however, the decree of change from frequent to rare visits is not quite as dramatic as expected. This is by no means a bad tendency – rather it is just an observation. The fact that the visits are not quite as frequent at first does not meant they are insufficient (or poorly scheduled). Instead it shows that they are just not that necessary. This is idea is further supported by the fact that initial visits for F32.3 (a severe condition) are very frequent indeed: when needed, visits are frequent.

The above observations suggest that the staff's prudence and qualification play the central role in treatment processes. For severe cases the frequencies and number of visits are high (and lower for milder cases) – whether in Peijas or in Jorvi.

Conclusion

Treatment method packaging has been shown to improve motivation and efficiency in other fields of medicine. This study aimed to find patterns in the treatment of depression to ultimately assist the implementation of packaging in psychiatry. The initial assumption of patterns existing was based on an official theoretical framework called the Current Care Guidelines, as well as an interview of several HUS managers. According to those sources, the grouping should be caused by the different methods that are employed in the treatment of depression (drugs, therapy, or both). At first however it was unclear where to look for these groups, so several variables were investigated.

The data available for the study included information about dates of visits, their costs, the place of treatment and the diagnosis of the patients. The treatment methods were not known, while they were likely to be the most significant grouping variables. An attempt was thus made to divide the visits into groups according to cost classes. Unfortunately this did not

show significant grouping. However, it was shown, that there is an inexplicable variance in the visiting costs although they are ought to be somewhat uniform.

Other variables that were investigated were the frequency and the number of visits per patient. The number of visits showed a smooth distributions with no remarkable grouping. However, the shapes of the distributions differed depending on the diagnosis, i.e. the severity of the episode. The same applied for the frequencies: the more severe an episode, the greater the number and the frequency of visits. This was in line with the CCG who state that the visits should be more frequent if the severity of the condition requires that. The number of visits were then fitted into a probability plot which allowed a construction of a table of cost estimates for given remission percentages, to give the client an idea of the distribution of costs for each diagnosis group. Additional analyses including the significance of inpatient care were conducted at the request of the client, but they showed no remarkable results in terms of the aim of this study.

The variable that finally revealed patterns was the duration of treatment. The analysis showed a number of distinct peaks in the distribution of durations. Although with the current data it was impossible to say with certainty what the underlying cause was (since treatment methods were unknown), but the pattern seemed to fit the CCG. In fact, this study provides a valuable real life look at the theory of the CCG which is mostly based on controlled studies. If the patterns seen in the distribution were indeed caused by the different treatment types, the patients could be split into groups based on those types, averages for them calculated, and hence treatment packages created.

Although no precise values for the sizes of the groups were found, conclusions were still made that support the initial hypothesis of distinct groups being found in the durations of treatment. The confirmation of the theory on practice allows further steps in treatment packaging to be made. Now that it has been shown that treatment periods exhibit grouping, with additional studies (namely with some that would explain the underlying causes and excluding the error factors), a packaging framework could be established.

If packaging would in fact progress, a great deal of advances are expected to take place. As experience in somatics suggests, the quality of records, the quality of internal reporting and the overall efficiency would grow significantly – the implementation of the new culture could very well be the next big step in the modernization of mental healthcare in Finland, and thus the promotion of national mental health.

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