

Effects from Text message Reminders on Attendance in a Psychiatric District Centre

*Do clients at first time consultations have higher fail to attend
rates?*

Morten Lykke Nielsen



Master thesis, Faculty of Medicine, Institute of Health Management
and Health Economics

UNIVERSITY OF OSLO

June 2008

Foreword

First of all, it would never been possible for me to accomplish this master thesis without the support from my beautiful lover and wife Tina. During my studies she gave me two wonderful children and all the support I needed to finish my work. Thank you for standing out with me, I love you, to the end of eternity.

My supervisor Knut Reidar Wangen at the institute of Health Management and Health Economics, University of Oslo deserves lots of credits. Thank you for your supportive way of discussing and commenting on my work.

I would also like to thank many helpful people at Lovisenberg District psychiatric Centre for helping me with my collection of data and information in general. Especially I would like to thank Per Arne Holman for his always positive attitude and help when I needed information.

Oslo, june 2008

Morten Lykke Nielsen

Table of contents

FOREWORD	2
TABLE OF CONTENTS	3
1. INTRODUCTION.....	5
2. PROJECT BACKGROUND.....	7
2.1 WHY USE TEXT MESSAGES REMINDERS?	7
2.2 NORWEGIAN DATA INSPECTORATE.....	8
2.3 UNIFIED MESSAGING SYSTEM.....	9
2.3.1 <i>Possible ways of reminding</i>	10
2.4 TREATMENT PROCESS	11
3. DIFFERENCES IN CLIENT BEHAVIOR	12
3.1 ARE PSYCHIATRIC AND SOMATIC OUTPATIENT ALIKE?	12
3.2 IS EVERY PSYCHIATRIC OUTPATIENT ALIKE?	13
3.2.1 <i>Foot in the door</i>	13
4. SEARCH FOR LITERATURE.....	15
5. METHODS AND MATERIALS.....	16
5.1.1 <i>Unintended effects at Lovisenberg</i>	20
5.2 REMINDER MESSAGES	21
6. POPULATIONS, DEFINITIONS AND VALUES	23
6.1 THEORETICAL POPULATIONS, DEFINITION AND VALUES	23
6.2 MY SAMPLE, DEFINITION AND VALUES	25
6.3 CONDITION.....	26
7. STATISTICALLY TESTS OF TEXT MESSAGES EFFECTS	27

- 7.1 EFFECTS ON ATTENDANCE BETWEEN THE TOTAL POPULATION AND MY OBSERVATIONS 27
 - 7.1.1 *Null hypotheses test*..... 27

- 7.2 EFFECTS ON ATTENDANCE IN THE GROUP IN MY OBSERVATIONS WHO RECEIVED TEXT MESSAGE REMINDER AND THE GROUP WHO DID NOT..... 29
 - 7.2.1 *Null hypothesis test* 30

- 7.3 FAIL TO ATTEND RATES AT FIRST TIME CONSULTATIONS, “FOOT IN THE DOOR” 31
 - 7.3.1 *Null hypothesis test* 32

- 8. MY GUIDANCE TO USE 34**
 - 8.1 PRODUCTIVE EFFICIENCY AND FIRST TIME CONSULTATIONS 35
 - 8.2 INCOME AND CLIENTS IN ESTABLISHED TREATMENT PROCESSES 36

- 9. DISCUSSION..... 38**

- 10. CONCLUSION 40**

- REFERENCES..... 42**

- APPENDIX 1: MY OBSERVATIONS 44**

1. introduction

No show or *fail to attend* (FTA) is a common problem for hospital outpatient services in general today. This is a bigger problem in psychiatric wards than somatic wards, but anyway it creates a number of problems for hospitals in providing optimal service to clients and to meet internal demands on efficiency and income. Therapists are using valuable time waiting for the client to show and office personal has to perform double administrative work. Hospitals become less efficient because replacement of no shows often is impossible and if it is possible it is time consuming and connected with high costs. In addition hospitals suffer from a loss in income, because of lost reimbursements.

According to previous studies the major causes of outpatient FTA is forgetfulness, practice error and a mix up over date and time (Chen et al. 2007). It is suggested that up to as many as 30 % of the no shows is because of forgetfulness.

In previous studies various reminder systems have been assessed with varying degrees of success in reducing broken appointments. Letters, postcard, automated phone calls and personalized phone calls are typically used efforts. But they have one problem in common, they are very labour intensive (Chen et al. 2007). New technology and the expanding use of mobile telephones makes it possible to send text messages reminders and get in touch with people, in a cost effective way.

Text message reminders are believed to have a positive effect on FTA rates, this is supported by previous research who shows a significant improvement in attendance rates when using Text message reminders. Downer et al. (2005) found the fail to attend rate to be 14.2% in the trail group who received a text message reminder and 23.4% in the control group. Sawyer et al. (2002) performed a randomised controlled study at an adolescent clinic. The use of reminders significantly reduced the FTA rates from 20% to 8%.

Some hospitals in Norway have started to use the text message possibilities to remind clients of their appointments. But little has been published on the effects on attendance and the utilization of the text message reminder system.

In this paper I want to investigate if text messages reminders have an effect on attendance in a psychiatric district centre in Oslo, Norway. I will use the data I collected during my internship supplemented by other research done in this field, to show you that text messages reminders has an effect on attendance.

In addition I want to investigate if there is a difference in attendance in the group of clients at first time consultations and the group of clients in an established treatment process. This possible difference leads to a question if one should provide the two groups of clients with different kind of text message reminders, to achieve higher productivity efficiency and to become as cost efficient as possible.

I will perform three statistical tests to see if my observations at Lovisenberg District Psychiatric Centre can support my thoughts of text message reminder effects on attendance and the differences in the group of clients. In addition I will use my findings to recommend Lovisenberg how to utilize the text message reminder system in order to become as productivity efficient and cost efficient as possible.

In this paper I will use Lovisenberg when I am referring to Lovisenberg District Psychiatric Centre. If I refer to Lovisenberg hospital as a whole I will use Lovisenberg hospital.

2. Project background

During my internship, in 2006, at Lovisenberg Psychiatric District Centre, I found that non-attendance for booked appointments or the failed to attend rate was considerable in size. Forgetfulness has been mentioned as the most important cause to “no show” and some kind of reminder system would probably be useful.

At the same time Lovisenberg hospital was discussing if they should implement a text message reminder system. This is a several million NOK investment. The decision to make the investment, as I was told, was made on information obtained from the supplier of the electronic text message reminder system. My first thought was that to make good decisions, information should be obtained from other perspectives in addition, like research and investments in similar projects at comparable enterprises. I decided to conduct a small pilot study to see if text message reminders could increase attendance as Lovisenberg expected. This is important if the investment is meant to be profitable.

During my studying I have been introduced to social psychology and some of human’s special psychological characters. This gave me an idea that the phenomenon called “foot in the door” might affect attendance positively, especially at consultations in established treatment processes. If attendance rates are different in different groups of clients, it might influence the way Lovisenberg should address the clients to utilize the text message system. My thought was that it is possible to influence forgetfulness and in that way attendance, even more, if we know who forgets most often.

2.1 Why use text messages reminders?

Text messaging is a popular method of communicating. At the end of 2006 there were 5,040,573 mobile subscriptions in Norway, and more than 5 billion text messages were sent in Norway the same year, a 100% increase from 2002 (Statistics

Norway, 2007). Text messages software allows large batches of text messaging to be delivered almost instantly, minimizing labour costs and all mobile telephones have the ability to accept these text messages.

The mobile phone has become a part of most people's everyday life. People bring it everywhere, use it actively and because of that they are, and want to be, easy accessible. Most people have one main phone, and it's possible to keep the phone number even if you make a change in subscription. The phone number has in that way become as private as the phone itself. Text messages do not require the mobile phone to be active nor necessarily within range and can be held for a number of days until the phone is active or within range. Furthermore, text messages are also regarded as a kind of a private letter. You do not open and read other people's messages. Voice call does not have that quality. These facts make text messages and mobile phone an excellent tool to get in touch with clients in a private way and remind them of their appointment.

This technology is already used by other private and public services in Norway today, like at car workshops, hairdressers and dentists. But the situation is different for hospitals. They handle private and often sensitive information and because of that they have to satisfy the demands of Norwegian law in securing the integrity of the client.

In Norway the Norwegian data inspectorate (NDI) plays an important role of in securing the integrity of such a system.

2.2 Norwegian data inspectorate

“The Norwegian data inspectorate plays an important role when it comes to protect persons from violation of their right to privacy through the processing of personal data. The NDI shall help to ensure that personal data are processed in accordance with fundamental respect for the right to privacy,

including the need to protect personal integrity and private life and ensure that personal data are of adequate quality” (The Data Inspectorate, 2008)

The NDI both controls and gives advices to enterprises in matters concerning data security. But hospitals are responsible for their own behaviour and responsible to act according to Norwegian law¹.

Hospitals are not allowed to send sensitive information, through letters, text messages, e-mail etc, without ensuring that the information addresses the right person. In addition Lovisenberg needs the client’s approval. This is done indirectly the moment the client hand over his or hers phone number.

Lovisenberg has chosen to use electronic solutions developed by Unified Messaging system.

2.3 Unified Messaging System

There are several suppliers of software that supports text messages services. Unified messaging system is a Norwegian company that has specialised in developing electronic dialogs in e-mail, voice call or text messages. They started a TEXT MESSAGE reminder pilot project in Helse Bergen, Haukeland university hospital in October 2002. The results there were very positive. The most important outcome of their survey was, as I see it, the findings of people who forgot their appointment. They found that approximately 30 % of the clients, who did not attend, simply forgot their appointment². This corresponds well to findings done in similar research (Murdock et al., 2002).

¹ The act of 14. April 2000.No. 31 relating to the processing of personal data.

² This information is given to me by UMS. It is not available for public.

If effects of text message reminders does have a positive effect on attendance, Lovisenberg should be able to be more effective and increase income just by reminding the clients of their appointment.

I will make a short description of the electronic dialog system delivered by Unified messaging system, to give the reader an idea of the possibilities hospitals have today when it comes to the use of this particular electronic solution.

2.3.1 Possible ways of reminding

Basically the text message reminder system is capable of generating two different kinds of text message reminders.

1. A simple text message reminder without sensitive information

The text messages sent from Lovisenberg is neutral and free from details and in that way it becomes non sensitive. If Lovisenberg by accident addresses the wrong client, the information would not tell who was meant to be the receiver and what kind of treatment they are offered. This text message simply reminds the receiver of an appointment at Lovisenberg hospital, at a given time and date.

2. A detailed text message reminder containing sensitive information.

This form of text messages allows detailed and sensitive information. If Lovisenberg wants to send detailed information they have to send a text messages asking the receiver to confirm his or hers identity. This is done by asking for the client's national identity number. If the national identity number matches the number the hospital has, the detailed text messages is sent to the patient.

Both ways of contacting clients allow the receiver to answer if he or she is coming or not. This option is very interesting because it gives the hospital a chance to know witch clients who cancel their appointments and a possibility to replace them. But there is a question of how clients will react to the possibility to cancel the consultation. Some people I have talked to at Lovisenberg believe that clients will

cancel consultations more often if it is too easily done. This is an interesting issue to look into in future research.

Hospitals in Norway today choose the non sensitive way of contacting clients, without the possibility to answer. This is probably because it is the easiest option to administrate.

There are some interesting managerial challenges connected to the use of new technology. One important question Lovisenberg has to consider is if the office personel working routines have to change to utilize the technology? We have to look at the treatment process and the client's attendance behaviour to understand how it is possible to utilize the technology without generating extra costs.

2.4 Treatment process

To get treatment in hospitals (specialised health services) in Norway, in this case at Lovisenberg, clients have to consult a general practitioner to obtain a physician referral. This procedure is the same for both somatic and psychiatric clients.

Lovisenberg has the responsibility for a specific district in Oslo and only clients from this area are referred to Lovisenberg. When Lovisenberg receives the referral they arrange time and place for the first consultation. When the client is assigned a consultation at Lovisenberg, a letter with necessary information is sent to the client. This letter is normally dispatched two to three weeks before consultation. After sending the information letter the office personnel starts to register patients in the patient administration system. In addition to patient information they use to register, they now register the client's mobile phone number and register that the client should receive a text message reminder. The electronic dialog system then generates a text messages to the patient at a defined point in time in relation to the consultation. Extra time use for additional client registration should be considered as an absolute minimum. At Lovisenberg they have chosen to send text messages reminders one day before consultation in a pilot project conducted in December 2007 and January 2008.

3. Differences in client behavior

What kind of challenges does Lovisenberg hospital meet when it comes to the attendance behaviour of their clients? Is the behaviour different between somatic and psychiatric clients? Are there differences within the group of psychiatric clients? This is important issues to look into because it might affect the way Lovisenberg should use the text message reminder technology to obtain the most effective use of the technology.

3.1 Are psychiatric and somatic outpatient alike?

There is a difference in outpatient attendance between psychiatric and somatic services. According to the numbers I got from Lovisenberg hospital³, the medical ward had a FTA rate at 16.8 % and the psychiatric ward had a FTA rate at 22.7 %, in 2006. This makes a difference in 5.9 percent points. I have not found any literature or research that supports this difference in attendance, but it seems reasonable to think that the behaviour to psychiatric and somatic clients is different in this matter too. This difference is hard to explain but it probably appears because of very different sickness behaviour and very different emotional relations to receive treatment.

Previous research done suggests that the negative emotions about going to see the doctor are greater than the increased benefit from keeping the appointment. In the study twenty-two participants (65%) mentioned emotional barriers as reasons for not keeping appointments (Naomi et al., 2004). It becomes the client's subjective emotional preferences that decide if he or she is going to keep the appointment or not.

If emotional preferences are as important as Naomi et al. suggest, it seems like a good explanation to why psychiatric clients have higher FTA rates than somatic clients. I

³ Numbers for internal use at Lovisenberg hospital, not available for public

find it reasonable to believe that psychiatric clients in general are having some kind of emotional problems in addition to the emotional stress connected to seeing a doctor. Because of that I suggest they have different preferences to achieving treatment.

3.2 Is every psychiatric outpatient alike?

If I divide the group of psychiatric outpatients into two subgroups:

1. Clients at first time consultations
2. Clients in established treatment processes

I find that there is a difference in attendance rates. Clients at first time consultations have a higher FTA rate than clients in established treatment processes. In my observation of clients at first time consultations, who did not receive a text message reminder, I found a FTA rate at 36 %. The all over FTA rate at Lovisenberg in 2006 was 22.7 %. This makes a difference in 13.3 percent points. I suggest that this difference is connected to a psychological phenomenon called “foot in the door”. There is a good reason to believe that the knowledge and understanding of the foot in the door phenomenon is able to help Lovisenberg to utilize the text message system better and to improve efficiency and income. Later in this paper I will give my suggestions on how Lovisenberg can utilize the text message technology. But first I will explain the phenomenon “foot in the door” to the reader.

3.2.1 Foot in the door

Psychological experiments suggest that if you want people to do you a big favour, get them to do a small favour first. This is why the door salesman wants to get inside your door or the carpet salesman in Istanbul offers you a cup of tea inside his shop. If they succeed in this first manoeuvre, the chance for selling you an object increases dramatically (Myers, 2004).

A characteristic difference between psychiatric and somatic treatment is the length of the treatment process. It is reasonable to believe that somatic clients have fewer consultations per treated client than psychiatric clients. According to Lovisenberg psychiatric district centre the average number of consultations in 2006 was between 12 and 15 per finished treatment. To my point of view this has an impact on the effects on attendances in a psychiatric ward. With a consultation once a week the client meet the therapist for a period of approximately 4-5 months. The first consultation is the hardest. Once you are inside the door it's easier to continue. The client builds up a kind of obligation to the therapist and simply has to keep the appointment.

An important part of the therapy is the relationship between the client and the therapist. The more often they meet, the closer the relationship gets. This is important for the quality of the treatment, but in addition the relation building seems to influences the FTA rate. I compare this relation building process to the psychological phenomena called "foot in the door".

I have not found any published literature that describes a difference in the group of psychiatric patient, but I believe the results I got from my observations at Lovisenberg will support my thoughts. I found a FTA rate in first time consultations, who did not receive a text message reminder, at 36 %. This is a high number compared to the all over 2006 FTA rate at 22.7 %. I will perform a statistically test later to see if my findings are statistically significant.

4. Search for literature

I will make a short description of how and what I have done in my search for literature about issues concerning effects of text message reminders.

I started my search in Pubmed, Medline and Cochrane. I was primarily looking for studies performed on my specific subject, effects of text messages reminders on outpatient attendance. I used the sentences: *text messages reminders, outpatient attendance and text messages reminders, outpatient attendance*. After a while I concluded that it was very time consuming searching in all three web-bases and I found many of the same articles or you could say few new articles. Because of that I started using Pubmed in combination with Google scholar. I found this less time consuming and I was satisfied with the outcome. After finding the most available and central articles I started using the references to locate other sited or related articles. In that way I also located the most used articles on the subject. After some reading, I discovered that the effects, on attendance in outpatient services, when using telephone voice calls seemed to be approximately the same as using text messages reminders. Because of that I enlarged my search by using the sentence *telephone reminders and outpatient attendance*. This gave me access to some research done at psychiatric outpatients.

I believe the articles I got access to covers my subject in a good way and have given me a reasonable good overview over the literature on this subject.

5. Methods and materials

My data collection was conducted during my internship at Lovisenberg hospital in Oslo. The data collection was approved by my supervisor and head manager of Lovisenberg psychiatric district centre. Other kind of approval was not sought because Lovisenberg already planned to implement an electronic text messages reminder system in near future and clients had provided contact telephone numbers on referrals or registration with the hospital.

When I decided to start collecting data I first had to decide which group of patient I wanted to look at. The group of clients at first time consultations was easy accessible and it would be possible for me to compare attendance rates between the group of clients at first time consultation to the group of clients in established treatment. Because of that I chose to use only patients offered their first time consultation, when I was going to collect my data. In that way it should be possible for me to perform statistically tests to see if my hypothesis about the phenomenon foot in the door is significant in addition to the testing of my hypothesis about text message reminder effects. I divided my observations of first time consultations into two groups.

1. Group receiving text messages reminder and
2. Group not receiving text messages reminder.

Once a week I received a list of clients offered their first consultation, from the office personnel. I then had to insure that the patient assigned consultation had been registered with a mobile phone number. If I did not find a mobile phone number I made a search in the phone catalogue. This was of course time consuming, but I knew my sample would be small and it was important for the outcome that it was possible for me to address as many as possible up to half of my observations, with a text message reminder.

I then sent a text message reminder to approximately half of the remaining list. What I didn't expect was a high rate of patient without mobile phone in the end of my collecting period. All of a sudden it was not possible for me to send text message reminders to as many as I wanted to. In addition Lovisenberg cancelled three consultations and this happened to be patients receiving text messages reminders. I decided to eliminate those three observations, because the FTA wasn't caused by the client, and in that way text messages reminders couldn't influence the outcome of attendance or no attendance. Hence my sample after approximately five weeks was 42 observations, 17 patients received text messages and 25 patients did not receive text messages.

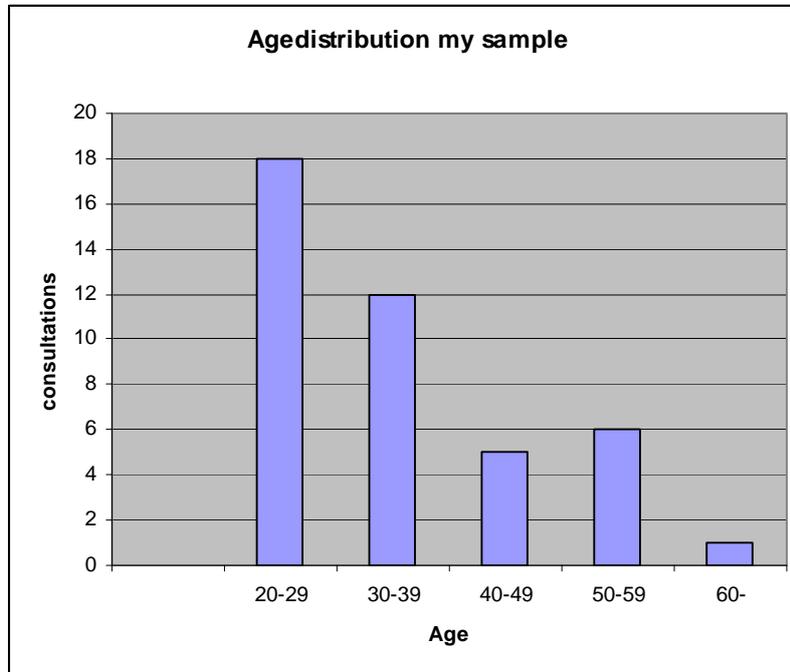
Because of my short period of stay (5 weeks) and because Lovisenberg only offered 8-10 new first time consultation a week, I had to take the data available. In that way it became impossible for me to collect my sample in a randomised way. In addition I got a smaller size of my sample than desired. The small sample size made it impossible to achieve statistically significant results, when it came to text message reminder effects on attendance and the foot in the door phenomenon. I have calculated the numbers needed to achieve the necessary size of the sample, to achieve statistically significant results in chapter 7.

There are several limitations of my observations and the outcome should be interpreted with these limitations in mind. First of all I found that not everybody had a mobile phone and I had to decide how I should address that issue. I decided that patients without mobile phone were put in group 2, not receiving text messages reminder in chapter 5.1. In similar research these clients should be held outside the observations. Because the group without mobile phone probably consists of elders, the group who receives text message is then likely to be overrepresented by youngsters. This could affect the effects of text message reminders as I will explain below.

Second, I found that the age distribution in my observations was skewed, 66 % of my observation were younger than 40. This is not unexpected because the age

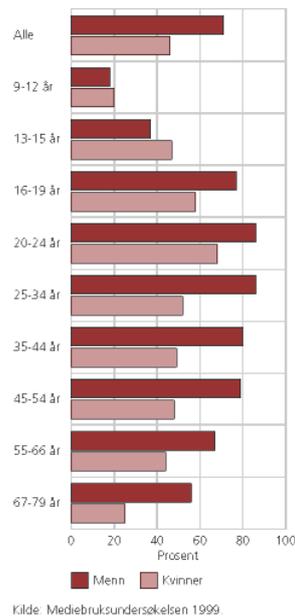
distribution at Lovisenberg in 2007 is very similar (ref. figure 3). But again the group who receives text message is likely to be overrepresented by youngsters

Figure 1: age distribution in my observations at first time consultations.



This is of interest because an overrepresentation of youngsters could bias the text message effects on my outcome. It is natural to think that younger people has a larger use of mobile phones. At statistics Norway I find numbers from 1999 that shows the distribution of mobile phones on age.

Figure 2: Part that owns mobile phone, on age and gender.



(Statistics Norway, 1999)

Even though it is rational to believe that elder people probably has a higher number of mobile phones today, I still believe the distribution of mobile phones on age favours the young part of the users. In my observations 11 (65 %) of the clients contacted by text message is in the age groups 20-29, 30-39.

This is biasing my outcome because of two reasons.

1. An earlier study indicates that FTA rate is highest in the group of young people (Frankel et al., 1989). Hence my results on text message effects are probably higher than it would be if the elder group of clients was higher represented in my observations.
2. My text message reminders is addressing the group with the highest use of mobile phone, this would probably affect the attendance rates even more. Again it would look like the effects of text message reminders is higher than they probably would be if the group of elders were higher represented.

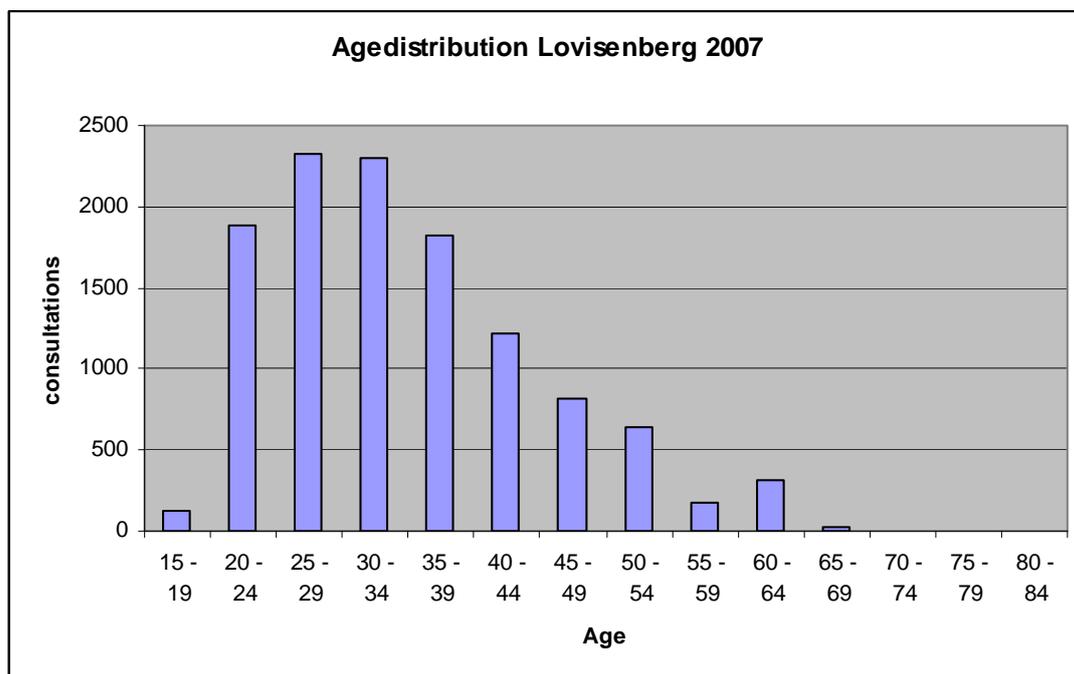
What I should have done, if it had been possible for me, was to send equal numbers of text message reminders in all five age groups. In that way my outcome would not be biased by higher effects on text message reminders in the groups of younger clients. This is important to remember in future research.

But even though this skewed sample affects the outcome of my observations, it seems like the distribution of age has some unintended positive effects on attendance, for Lovisenberg.

5.1.1 Unintended effects at Lovisenberg

If I look at the over all age distribution at Lovisenberg in 2007 (fig 3) I find the age distribution to be very similar my observations.

Figure 3: age distribution at Lovisenberg district centre 2007



(Lovisenberg, 2007⁴)

⁴ Internal numbers from Lovisenberg, not public available

The fact that elders are less represented at Lovisenberg District Psychiatric Centre is not a big problem. It is actually an advantage if you want to use text message reminders to increase attendance. Elders have a high attendance rate and text messages reminders would not have a major impact anyway. Vice versa, text messages reminders might have an even higher effect on younger clients because they address the group with the highest FTA rate, and the group who really uses mobile phones. In that way the use of text message reminders should have unintentionally positive effects on attendance, at Lovisenberg.

5.2 Reminder messages

The text message reminder was conducted and dispatched by me and the message was designed to maintain client confidentiality, according to requirements from NDI. The message read: *remember your appointment at [clinic name] on [day] [date] at [time]. Please call [phone number] if you are not able to attend, or have questions. Many greetings Lovisenberg Hospital.* Message was sent 3 working days before the appointment date. This lead time was chosen, because a longer lead time (5-10 days) increases the possibility of patients forgetting the appointment again after receiving the text messages reminder. A lead time of 1-2 days might affect attendance rates positively because it would be easier to remember the appointment. But 1-2 days would give both client and hospital a very short time to rearrange appointments and this is an important issue when it comes to working with first time consultations.

I registered the client's name, phone number and time of consultation in a notebook and each client was marked with a number. Once a week I extracted patient attendance data from the patient administration system (PAS). I registered my findings in an excel file, but here I used only client numbers. No names, addresses or phone numbers were used. In this way my data was made anonymous and it was possible for me to work with and present the data outside the hospital.

In my observation of 42 first time consultations, 31 clients attended. If I compare my findings to the numbers I got from Lovisenberg Hospital I find that my data absence rate is $(42-31)/42=0.26 = 26 \%$. This is absence for first time consultations. The numbers I got from Lovisenberg Hospital indicates that the overall absence rate is close to 22.5%. This supports my theory that absence's for first time consultations is higher than absence for consultations in general, too.

This result could be a coincidence and because of that I would like to build some statistical arguments.

6. Populations, definitions and values

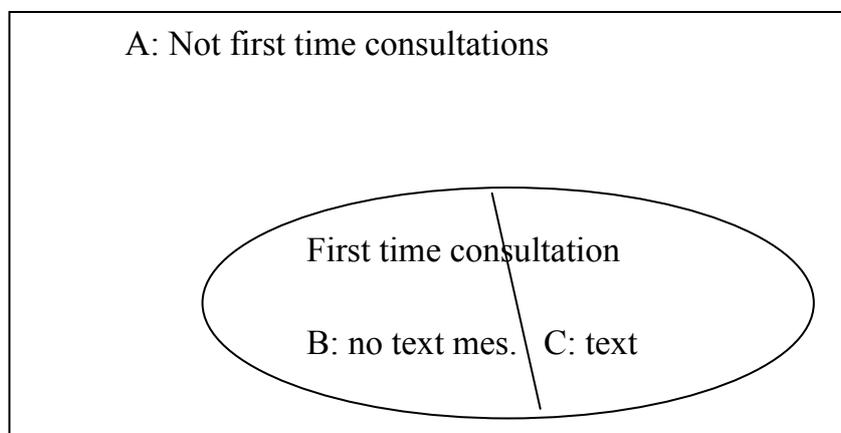
I want to conduct three statistical tests to see if my observations at Lovisenberg can support my theories about text messages effects and the foot in the door phenomenon. First I will define my populations and explain definitions and values. When I perform the statistical tests I am looking at a theoretical population and the population of my sample.

6.1 Theoretical Populations, definition and values

I created the main population theoretically in order to systematise how I would like to define the world of consultations at Lovisenberg District Psychiatric Centre. The different groups I have designed does not exist at Lovisenberg because they do not distinguish between different types of consultations.

The theoretical population is corresponding with the definitions and values in my sample. I distinguish between the theoretical populations and my sample population by marking the proportions in my sample with a \hat{P} and use small letters when I am referring to the numbers.

Fig 3: Theoretical total population



The total population is divided into two main populations

A: Not first time consultation

B+C: First time consultation

and the population of first time consultations is divided into two subpopulations.

B: Part of first time consultations who did not receive a text messages reminder.

C: Part of first time consultations who received a text messages reminder.

The total number N of all consultations: $N = N_A + N_{BC} = N_A + N_B + N_C$

Table 1: Definitions

Population	Number of units	Part of no show
All consultations at Lovisenberg DPC in 2006	$N = 15202$	$P = 22,7\%$ assumed known
A: Not first time consultation	N_A	P_A unknown
First time consultation	$N_{BC} = N_B + N_C$	P_{BC} unknown
B: No text messages	N_B	P_B unknown
C: Text messages	N_C	P_C unknown

Lovisenberg had never used text message reminders when I collected my data. Because of that all numbers of units and proportions, but “all consultations”, is unknown.

6.2 My sample, definition and values

My sample is drawn from a population of first time consultations.

Figure 4: My observations of first time consultations

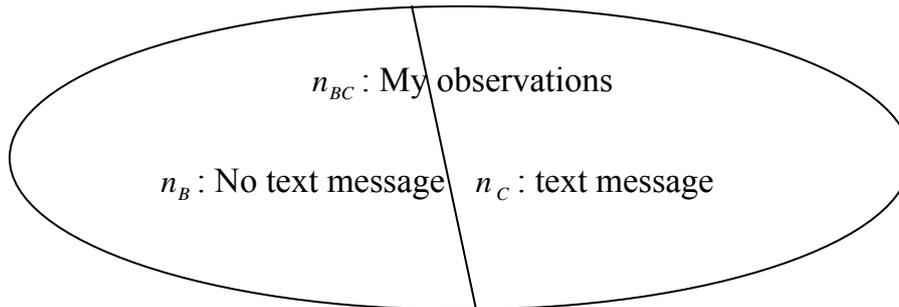


Table 2: Definitions and descriptive statistics

Sample	Number of observations	Part of no show
My observations	$n_{BC} = 42$	$\hat{P}_{BC} = 26.2\%$
No text messages	$n_B = 25$	$\hat{P}_B = 36\%$
Text messages	$n_C = 17$	$\hat{P}_C = 12\%$

In the group of clients who did not receive a text message reminder I found that 9 out of 25 did not show. That gives a FTA rate at 36%. In the group of clients who received a text message reminder I found that 2 out of 17 did not show. That gives a FTA rate at 12%. The FTA rate in my total observations equals 26.2%, a difference in attendance at 3.5 percent points from the FTA rate in the total population at Lovisenberg in 2006. I want to test if these differences are significant or if these differences are occurring because of a coincidence. If we assume there is no

difference in attendance between first time consultations and consultations in general, it is possible to perform different hypothesis tests and find out if my observed results are statistically significant.

6.3 Condition

Since my observations can result in two different exclusive and collectively different outcomes, “success”= no show and “failure”= show, and I have a known probability for success, my observations are binominal distributed (Newbold et al. 2006). The binominal distribution is close to the normal distribution when the number of observations is of a reasonable size. When n denote the number of observations and p is the possibility to succeed (no show), the condition for approximately normal distribution is fulfilled if:

$$(1) \quad np \geq 5 \quad \text{and} \quad n(1-p) \geq 5$$

Confer Aalen et al. (2006) p. 132-134

7. Statistically tests of text messages effects

I will perform two kinds of tests. The population proportion test to see if there is a significant difference in attendance between the total population and first time consultations. In the second test, equality of two population proportions, I want to test if there is a significant difference in attendance in the two groups in my observations. My results are affected by effects of text messages reminders and the fact that I have to few observation. I will comment on these issues during the tests.

7.1 Effects on attendance between the total population and my observations

First I will test if there is a significant difference in attendance in the total population and first time consultations. I am using the population proportion test (Newbold et al. 2006) to test P vs. P_{BC} .

We assume that a random sample of n observations from a population that has a proportion P . We will let P denote the proportion of no shows among all consultations at Lovisenberg District Centre in 2006 and P_{BC} denote the corresponding proportion of the theoretical population of first time consultations. \hat{P}_{BC} denotes a randomized sample from the first time consultation population (my observations). \hat{P} is the estimated part of no shows. The test has a significance level at α :

7.1.1 Null hypotheses test

I will test the null hypothesis

H_0 = there is no difference in attendance in the total population and first time consultations.

$$H_0 : P = P_{BC}$$

Against the alternative hypothesis

H_1 = there is a difference in attendance in first time consultations and the total population

$$H_1 : P < P_{BC}$$

To test the condition I will use corresponding proportions from Table 1 and 2 and insert them into equation (1)

$$n_{BC}P = 42 \times 0,227 = 9,534 \quad \text{and} \quad n(1 - P) = 42(1 - 0,227) = 32,5$$

The condition is fulfilled and the normal distribution is a good approximation to the binominal distribution.

The decision rule at the $\alpha=5\%$ significance level is to reject H_0 and accept H_1 if:

$$(2) \quad \hat{Z} = \frac{\hat{P}_{BC} - P}{\sqrt{\frac{P_A(1 - P_A)}{n}}} > Z_{\alpha} = Z_{0,05} = 1,645$$

When inserting corresponding numbers from Table 1 and 2 in equation (2), I find:

$$\hat{Z} = \frac{0,262 - 0,227}{\sqrt{\frac{0,227(1 - 0,227)}{42}}} = 0,5415 < 1,645$$

I keep my H_0 = there is no difference in attendance in my sample and the total population.

Even though the part of no shows in my observations show a rate at 26.6 % and the year 2006 results from Lovisenberg District Centre show a no show rate at 22.7 %, I have to conclude that my observations are not statistically significant. I believe this result occur because my observations are too few.

If I put \hat{Z} equal to 1,645, I find n to be approximately 387.

$$\hat{Z} = \frac{0.262 - 0.227}{\sqrt{\frac{0.227(1 - 0.227)}{n}}} = 1,645 \quad n \approx 387$$

With a fail to attend rate at 26. 2% in my sample I would have needed approximately 387 observations to get significant results.

But I would properly need fewer observations because 17 of my observation received a text messages reminder. If text messages reminders have a positive impact on attendance rate, my FTA rate at 26. 7 % should be even higher. A higher difference in FTA rate supports my hypothesis that there is a difference between attendance in first time consultations and consultations in general. In addition first time consultations are included in the FTA rate in the total population. A FTA rate in the total population excluding first time consultations would most likely give a lower FTA rate, because of the foot in the door phenomenon. Hence, a sample where nobody received a text messages reminder and a population excluding first time consultations would probably give even higher differences in FTA rates. This is important issues to remember if similar research is planned in the future.

7.2 Effects on attendance in the group in my observations who received text message reminder and the group who did not

Here I want to test if there is a significant difference, in attendance, between the two groups in my observations, the group of first time consultations who did not receive a text message, and the group who received a text message. I am using the equality of two population proportion test (Newbold et al. 2006) to test P_B vs P_C .

With an independent sample size of n_B and n_C , with proportion success p_B and p_C and we assume that the population proportions are equal, an estimate of the common proportion is:

$$P_{BC} = \frac{n_B p_B + n_C p_C}{n_B + n_C}$$

When inserting corresponding numbers from table 2 I find $P_{BC} = 0,263$

7.2.1 Null hypothesis test

I will test the null hypothesis

H_0 = there is no difference in attendance between the group who receive text messages reminders, and the group who do not receive text messages reminder

$$H_0 : p_B = p_C \quad \text{or} \quad H_0 : p_B - p_C = 0$$

Against alternative

H_1 = there is a higher attendance rate in the group who receive text messages reminders, than in the group who do not receive text messages reminder

$$H_1 : p_B < p_C \quad \text{or} \quad H_1 : p_B - p_C < 0$$

Because I assume in my null hypothesis that $p_B = p_C$ it is reasonable to test the condition for the joint probability, P_{BC} . Since this probability is unknown, I use the estimate \hat{P}_{BC} and the number of observations. To test the condition I will use corresponding proportions from Table 1 and 2 and insert them into equation (1)

$$(1) \quad n_{BC} \hat{p}_{BC} = 42 \times 0.262 = 11 \quad \text{and} \quad n_{BC} (1 - \hat{p}_{BC}) = 31$$

The condition is fulfilled and the normal distribution is a good approximation to the binominal distribution.

The decision rule at the $\alpha=5\%$ significance level is to reject H_0 and accept H_1 if:

$$(3) \quad \hat{Z} = \frac{(\hat{p}_B - \hat{p}_C)}{\sqrt{\frac{p_{BC}(1-p_{BC})}{n_B} + \frac{p_{BC}(1-p_{BC})}{n_C}}} < -Z_\alpha = -Z_{0,05} = -1,645$$

When inserting corresponding numbers from Table 2 in equation (3), I find:

$$\hat{Z} = \frac{(0.12 - 0.36)}{\sqrt{\frac{0.263(1-0.263)}{17} + \frac{0.263(1-0.263)}{25}}} < -1,96 \quad -5,5162 < -1,96$$

I will reject H_0 and accept the alternative hypothesis H_1 . My differences in my observations are statistically significant and support my theory that text messages reminders have an effect. My observations, who did not receive a text messages, show a FTA rate at 36 % and my observations who did receive text messages show a FTA rate at 12 %. This is a difference in 24 percent points.

7.3 Fail to attend rates at first time consultations, “Foot in the door”

Now I want to test if there is a significant difference, in attendance, between the group in my observations who did not receive a text messages, and the total population. This is interesting because no one in the total population received a text messages. In that way I am comparing the group of first time consultations, unaffected by text message reminders, to the total population. In other words, I am testing if my theory about the psychological phenomenon “foot in the door” has any statistically support. I am using the population proportion test to test P_B vs P

We assume that a random sample of n observations from a population that has a proportion P_B . We will let P denote the proportion of all consultations at Lovisenberg Psychiatric District Centre in 2006 and P_B denote first time consultations who did not receive a text messages.

7.3.1 Null hypothesis test

I will test the null hypothesis

H_0 = there is no difference in attendance between the total population and the group who did not receive text messages in first time consultations.

$$H_0 : P_A = P_B$$

Against the alternative

H_1 = there is a difference in attendance between the group who did not receive text messages in first time consultations, and the total population

$$H_1 : P_A < P_B$$

To test the condition I will use corresponding proportions from Table 1 and 2 and Insert them into equation (1)

$$(1) \quad np = 25 \times 0,227 = 5,675 \quad \text{and} \quad n(1-p) = 25(1-0,227) = 19,3$$

The condition is fulfilled and the normal distribution is a good approximation to the binominal distribution.

The decision rule is

Reject H_0 and accept H_1 if:

$$(2) \quad \hat{Z} = \frac{\hat{P}_B - P}{\sqrt{\frac{P(1-P)}{n_B}}} < -Z\alpha = Z_{0,05} = -1,645$$

Inserting corresponding numbers from table 1 and 2 I find

$$\hat{Z} = \frac{0,36 - 0,227}{\sqrt{\frac{0,227(1-0,227)}{25}}} = -1,5875 > -1,645$$

The value \hat{Z} is higher than $Z_{0,05}$ and my observation is not statistically significant. I keep the null hypothesis. But in despite of only 25 observations, I am very close to a statistically significant result. I probably need only a few more observation to get significant values.

If I put \hat{Z} equal to 1,645, I find n to be approximately 27.

$$\hat{Z} = \frac{0,36 - 0,227}{\sqrt{\frac{0,227(1 - 0,227)}{n}}} = 1,645 \quad n \approx 27$$

With two more observation and everything equal the results would have been statistically significant. I believe this really supports my theory that the FTA rate is higher at first time consultations.

8. My guidance to use

A sensible goal when research is conducted must be the possibility to use the results in real life situations. This is an important aspect for me and because of that I want to present some solutions in the use of text message reminders, based on my findings at Lovisenberg. My suggestions assume that text message reminders have a positive effect on attendance. I believe this is supported by my findings in addition to previous research done on the subject as mentioned in the introduction.

The effects from text messages are going to help Lovisenberg to improve the attendance rates in general and as a consequence of that the productivity efficiency and income will increase. But I believe it is possible for Lovisenberg to improve both efficiency and income even more. This is done by dividing their clients into two different kinds of psychiatric outpatient groups.

1. First time consultations
 - Focus on replacement and productivity efficiency
2. Clients in established treatment processes
 - Focus on cost effectiveness and income improvements

By addressing the groups with different kind of text message reminders, Lovisenberg should be able to utilizing the text message reminder system better and gain even higher effects from the technology.

To make sure the reader understand what I am talking about when I am going to suggest how Lovisenberg could use the text message reminder system, I want clarity around the concepts productivity efficiency and income.

8.1 Productive efficiency and first time consultations

Clewer and Perkins define productivity efficiency as maximum quantity of output with given quantities of inputs (Clewer, 1998). Productivity efficiency does not tell us anything about the quality of the treatment or if the treatment was successful. It tells us only how many clients was treated (output) compared to the number of clients offered treatment (input). I assume Lovisenberg has a clear opinion on how many clients they are able to treat per year, and the number of new treatments, first time consultations, is adjusted to that number. If Lovisenberg expects and offers 11500 treatments a year, an output below 11500 indicates inefficiency.

Because all treatments have to finish, increased input leads to increased output. Lovisenberg should be able to affect the productivity efficiency by starting as many planned first time consultations as possible. Idealistically all new consultations, 8-10 a week, are initiated. When it comes to first time consultations, I find it natural that focus on this group is related to the productivity efficiency at Lovisenberg. The group of first time consultations is a small group compared to the group of clients in an established treatment processes, and it is possible to replace “no shows” without creating capacity problems. The client who is not able to attend offered consultation is simply given a new first time consultation later in time, when capacity is available. We are talking of no more than approximately 8-10 new clients a week. In my observations of first time consultations who did receive a text message reminder, I found an FTA rate at 12 %. This FTA rate will result in approximately 1-2 clients a week who is expected to cancel their first time consultation and needs to be replaced. If the office personnel know who is not coming, it should be possible to replace clients at first time consultations without to much labour use. In that way the impact on cost effectiveness becomes insignificant. A very interesting issue to pursue in future research is the effects this focus on increased productivity efficiency would have on waiting lists.

I will suggest that Lovisenberg address this group of clients with a text message reminder approximately three days before consultation. In addition it should be

possible for the client to give an electronic answer if he or she intends to keep the appointment. This is very important because knowledge of cancellations in two to three days notice, would give Lovisenberg a chance to rearrange time schedule. This would require the office personnel to create a list of patients willing to step in at available consultations, in short notice.

8.2 Income and clients in established treatment processes

To increase income Lovisenberg primarily has to increase the attendance of the clients already offered consultations. Increased attendance leads to an increase in reimbursements and income.

Lovisenberg district psychiatric centre had planned to carry out approximately 11500 consultations in 2006, and most of these consultations are offered clients in established treatment processes. With 8-10 new consultations a week, only approximately 500 of the planed consultation a year is offered to first time consultations. Hence, just about 11000 consultations a year should be offered to clients in established treatment. If my theory about the foot in the door and the text message reminders have expected effects it should be reasonable to assume that the FTA rate at consultations in established treatment could be reduced to approximately 10 %. This would result in approximately 20 cancellations a week. It is reasonable to believe that the labour costs generated if replacement should be done, would become considerable.

To make the text message reminder investment as cost effective as possible Lovisenberg should spend as little additional resources as possible to increased attendance rates beyond the effects from text message reminders. Because of that I suggest that the group of clients in established treatment is addressed with a simple text message reminder 1-3 days before consultation, without possibility to answer. Towards this group of clients Lovisenberg should simply lean back and enjoy the effects of the text message reminder system and accept the fact that it is not possible

to achieve 100 % attendance without generating high negative effects on costs. The effects of text message reminders in combination with “the foot in the door” phenomenon will generate higher attendance rates and this should affect income positively.

It is important to have in mind that because of the size of the group it is possible, even with minor positive effects on attendance, to achieve considerable positive impact on income.

9. Discussion

There are several problems connected to utilizing the text message reminder system.

The most crucial question is how Lovisenberg is going to obtain as many mobile phone numbers as possible. This is mainly a problem at first time consultations, because Lovisenberg can ask for missing phone numbers once the client attend the first consultation. I have shown that attendance rates are lower at first time consultations, in addition I have suggested that Lovisenberg should use resources to replace cancelled appointments in this group of clients. To address these problems Lovisenberg needs to obtain as many mobile phone numbers as possible. The most logical way to solve this problem is to make an agreement with the general practitioners connected to the district covered by Lovisenberg hospital. The general practitioners should make a routine of writing mobile phone numbers on the referral, if the client wants to. It should be possible for the general practitioner to do that without any particular extra time use.

Another question is what Lovisenberg should do if clients do not have a mobile telephone. The part of clients without mobile phones is probably very small. In addition it is mostly elders who are without mobile phones and that group has a high attendance rate anyway. Because of these issues I find it unnecessary that Lovisenberg use labour recourses to deal with this problem.

People I talked to at Lovisenberg expressed concerns about problems connected to the possibility, client have, to give an electronic answer whether they come or not. It was argued that FTA rates would increase, because it will be too easy to cancel the appointment. I find some positive and negative arguments in sending text message reminders with the possibility to answer. The most obvious advantage is the possibility Lovisenberg achieves to rearrange schedule. I argued in chapter 8.1, that rearranging schedules could have an important positive impact on productivity efficiency. This again leads to increased income and maybe it has impacts on waiting

lists as well. The negative side of text message reminders with the possibility to answer is the possibility of increased cancellations. But if Lovisenberg follow my suggestions and give only clients at first time consultations the possibility to answer, this should be a limited problem, because of the relatively small size of this group of clients. More cancellations generates increased costs, because of more labour use when office personnel have to rearrange schedule, but again I argue that this is a minor problem because of the size of the group of clients at first time consultations.

An interesting managerial challenge is to investigate what happens to the working routines to the personnel in general and what actual time use is connected to managing the new technology? It is important that the schedule update is performed as cost effective as possible. If this is done most effectively by the office personnel or if the therapists should use a few minutes at the end of the consultation to administer the client data, is an interesting managerial challenge and decision to make. But Lovisenberg has to address these issues to find out how much and what kind of recourses they are going to invest to improve attendance.

10. Conclusion

Even though it is difficult to measure the exact effects of text message reminders on attendance in a psychiatric outpatient clinic, I find it reasonable to believe that the effects are positive. My observations gave good support to my hypothesis about the text message reminder effects on attendance, even though they were not statistically significant. Previous research shows a statistically significant positive effect on attendance when text message reminders are used. The degree of effects varies with different geographical regions and different kinds of diseases.

In addition I believe my observations gives good support to my theory about the foot in the door phenomenon.

The knowledge of these effects makes it possible to Lovisenberg to utilize the text message technology in the best possible way. To which degree Lovisenberg are able to utilize the text message reminder system probably depends on how they organize the office personnel and their working routines. I have argued that Lovisenberg should be able to increase effects of text message reminders even more if they divide their client into two groups, first time consultations and consultations in established treatment and address them with different kind of text message reminders. It is important to keep in mind that the system should be utilized as cost effective as possible. A minimum input of labour should be used.

It would be helpful to learn more about why clients do not keep their appointments and how they view text messages reminders. In addition it would be very interesting to look into the effects text message reminders might have on waiting lists. Increased efficiency could be looked at as increased supply of psychiatric services. Economic theory argues that increased supply leads to increased demand. A good question is whether increased efficiency is going to shorten waiting lists or just increase demand of psychiatric services.

After writing this paper I am sure that text message reminders are going to help Lovisenberg to improve attendance rates. Whether the investment is profitable or not is still to find out.

References

- Aalen, O. O. (ed.) (2006) Statistiske metoder I medisin og helsefag. Gyldendal akademiske. 132-134
- Chen, Z.-W., L.-Z. Fang, L.-Y. Chen, H.-L. Dai. (2007). Comparison of an SMS text messaging and phone reminder to improve attendance at a health promotion center: A randomized controlled trail. Journal of Zhejiang University Science. 9 : 34
- Clewer, A., D. Perkins (1998). Economics for health care management. London, Prentice Hall.
- Downer Sean R., J.G. Meara, A.C. Da Costa. (2005). Use of SMS text messaging to improve outpatient attendance. The Medical Journal of Australia. 183: 366-368
- Frankel S., A. Farrow, R. West (1989). Non-attendance or non-invitation? A case-control study of failed outpatient appointments. British Medical Journal. 298:1343-1345
- Naomi, L.L., A. Paulman, M.D. Reuter, B. Lovejoy (2004) Why We Don't Come: Patient Perceptions on No-Shows. Annals of family medicine. 2:541
- Newbold, P., W.L. Carlson, B. Thorne (2006) Statistics for business and economics. Upper Saddle River, N.J., Prentice Hall.
- Murdock, A., C. Rodgers, H. Lindsay, T.C.K. Tham (2002). Why do patients not keep their appointments? Prospective study in a gastroenterology outpatient clinic. Journal of the Royal Society of Medicine. 95:284.
- Myers, D.G. (2004). *Exploring Social Psychology*. Mcgraw Hill.
- Sawyer, SM., A. Zalan, LM. Bond. (2002). Telephone reminders improve adolescent clinic attendance: A randomized controlled trial. Journal of Paediatrics and Child Health. 38:79-83

Statistics Norway. (2007). *Teletjenester. 31. desember*. Available at url: <http://www.ssb.no/aarbok/tab/tab-441.html>. Visited 02.02.2008. (In Norwegian)

Statistics Norway. (1999). *Andel som eier mobiltelefon, etter alder og kjønn*. Available at url: <http://www.ssb.no/samfunnsspeilet/utg/200006/Fig6-5.shtml>. Visited 26.01.2008. (In Norwegian)

The Data Inspectorate. (2008). *Personvern-din rett til å velge*. Available at url: http://www.datatilsynet.no/templates/Page_194.aspx. Visited 18.02.2008. (In Norwegian)

The Data Inspectorate. (2008). *Act of 14 April 2000 No. 31, relating to the processing of personal data*. Available at url: http://www.datatilsynet.no/upload/Dokumenter/regelverk/lov_forskrift/lov-20000414-031-eng.pdf. Visited 13.03.2008

The Norwegian Labour and Welfare administration. (2008). *Egenandeler for helsetjenesten*. Available at url: <http://www.nav.no/page?id=354>. Visited 11.05.2008. (In Norwegian)

Appendix 1: My observations

Client id	Contact	Attendance	Age
1	0	1	43
2	1	1	21
3	0	0	45
4	0	1	33
5	1	1	29
6	0	0	56
7	0	1	36
8	1	1	39
9	1	1	39
10	0	1	33
11	1	1	22
12	0	1	56
13	0	1	26
14	1	1	34
15	0	0	47
16	0	1	23
17	0	1	39
18	0	1	21
19	0	1	28
20	1	0	47
21	0	0	31
22	1	1	24
23	0	0	30
24	1	1	22
25	1	1	42
26	0	0	21
27	0	1	21
28	0	1	51
29	0	0	57
30	1	1	25
31	1	1	34
32	0	1	27
33	1	1	35
34	0	1	23
35	1	1	39
36	1	0	61
37	0	1	53
38	1	1	20
39	0	0	24
40	0	0	21
41	0	1	53
42	1	1	28

Contact
:
0=no text message
1=text message

Attend: 0=no show
1=show