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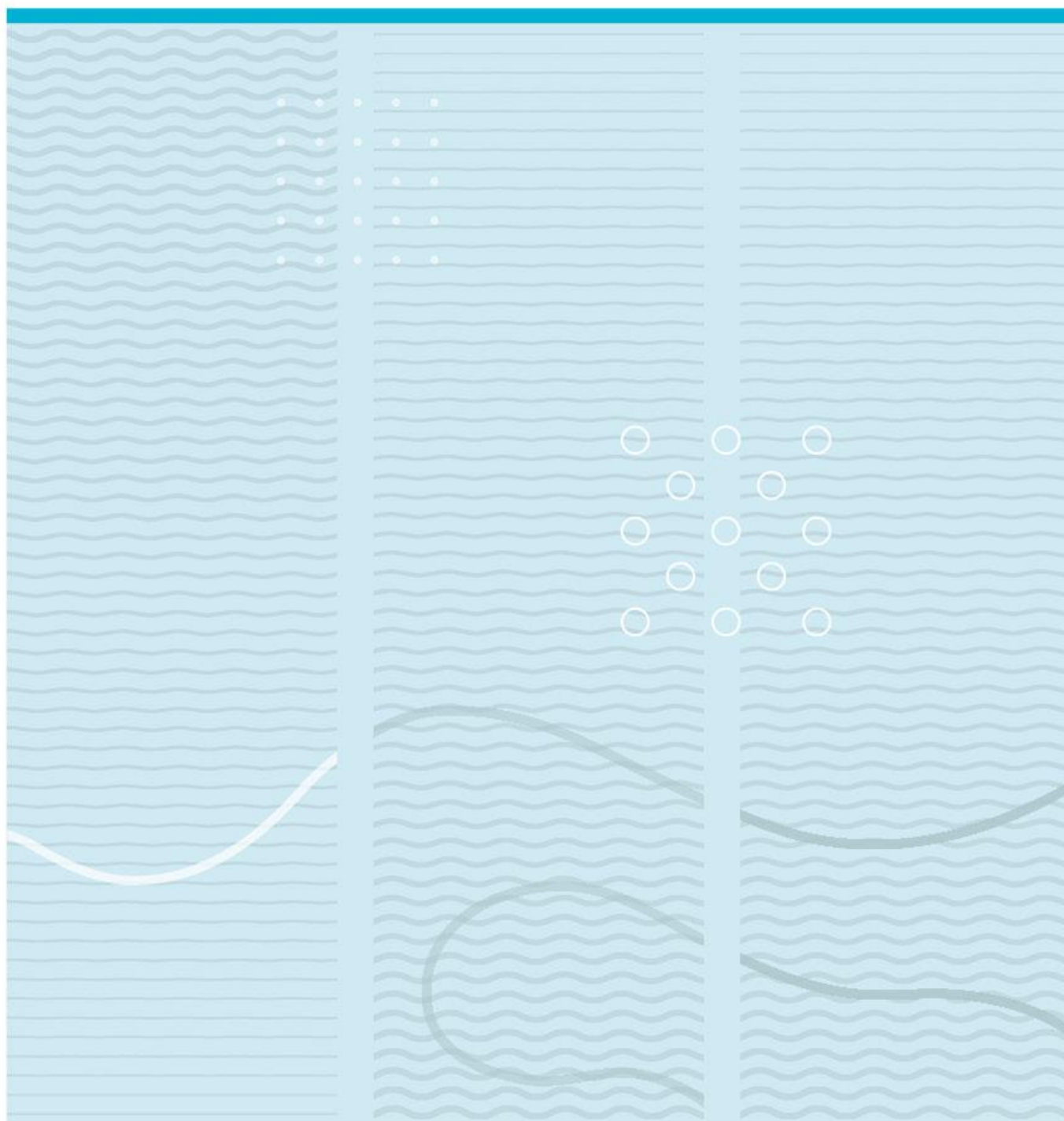
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## Public Trust in Medical Data Security and Handling in Norway



# 1 Acknowledgement

With this report in the course MIS500-1 Master Thesis in Management Information Systems, we complete a 2-year education at the University of South-eastern Norway. As we finish this master's thesis, we are left with new knowledge and experiences that we can take with us further into work contexts. We would also like to thank our professor and supervisor Karen Stendal for good guidance, quick feedback, and encouragement along the way.

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## 2 Abstract

This study aims to gain an understanding of how much the Norwegian public trust the security and handling of their medical data by general practitioners (GP) and medical practitioners at hospitals. The research question we investigated was “*How much does the Norwegian public trust in the handling and security of their medical data?*”. It provides a new look on the topic in a Norwegian context while providing new insight, findings, and interpretations which can be used to determine what kind of improvements both general practitioners and hospitals should focus on in the future. The research conducted to answer this question was a quantitative research approach. We found that the Norwegian public have a fair amount of trust in their GP, while there are exceptions, such as their knowledge regarding data security. They neither trust nor distrust their hospitals in general, although trust in restricted access to related staff regarding their medical data is noticeably low. We interpret that the high levels of trust in GPs stems from the personal relationship they have with their patients, contributing to a trusting relationship. Media coverage of issues at hospitals could be the main contributor to lower trust in hospitals compared to GPs. Hospitals should make it clear that medical data can't be viewed by unrelated staff to their patients. GPs should receive more frequent cybersecurity training and cybersecurity guideline reminders.

Keywords: *eHealth, Medical Data, Medical Records, Data Handling, Data security, Satisfaction, Worry, Trust*

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## 6 Introduction

This master thesis aims to uncover the level of trust the Norwegian public has towards hospitals and GP's handling and security of their medical data, as well as how satisfied and worried they are in the treatment of medical data. Personal Data is information about an individual that can be used to identify and create a picture of their identity (i-SCOOP, 2022). This data is considered valuable, since advertisers can use it to tailor their ads to the needs of the individual. This creates a situation where theft of personal data is profitable, as it can be sold on the dark web or be used to impersonate someone for various reasons (Sempf, 2019).

The growth of eHealth technologies supporting health and healthcare has turned medical data storage from paper-based to an electrical and database-stored system with the adoption of electronic medical records (Singhal, 2020). This has made the handling of medical data easier for medical practitioners because they can gain quick access to their patients' medical information (Menachemi & Collum, 2011). Hospitals will also have access to critical information fast during emergency situations (TrinnVis, 2022). Medical data contains sensitive health-related information. The protection of Medical Data is constantly at risk from different threats aiming to corrupt or steal data, since they can use it to purchase prescriptions and receive treatment under a false identity (Vanderburg, 2021). For that reason, increased cybersecurity training and guidelines for both GPs and hospital staff are needed, and they ought to be up to date with the latest cybersecurity threats (Rosencrance, 2021).

The handling of medical data ever since electronic medical records has become standard has improved medical practitioners' ability to provide quality service to patients, while at the same time creating new security risks regarding the information stored on it. There have been instances where Norsk Helsenett, which hosts the central database for all medical data in Norway, have mistakenly allowed patients to gain access to other patient's medical data. This has sparked worry among patients regarding the safety of their information (Knudsen, 2016). Some doctors are also resistant to using the patient summary care record since they feel a loss of control of the care process, as well as not trusting manually updated information by other doctors (Dyb & Warth, 2018). If medical practitioners themselves are distrustful towards eHealth technologies, it would not be surprising if patients themselves have a hard time trusting handling during the medical data process.

It would therefore be interesting to find out whether or not the Norwegian public have trust in GPs and hospitals being able to properly treat their personal information, and if their worry regarding its safety have made Norwegians distrustful. Based on this information, our research question is as follows:

*“How much does the Norwegian public trust in the handling and security of their medical data?”*

Our study defines eHealth, medical data, medical journals, data handling and data security in *Related Literature*. *Hypotheses* are prepared based on information about satisfaction, worry and the relationship both of them have with trust. Our data collection and analysis process is then presented in *Research Methodology*, including both the validity of our research method and its limitations. Furthermore, the *Results* will be presented, including a *Discussion* on the implications it has on the topic and some recommendations for both GPs and hospitals. “*Public Trust in Medical Data Security and Handling in Norway*” closes off with a *Conclusion* that covers the implications of the thesis, including some suggestions for potential future research.

## 7 Related Literature

In this section, relevant concepts will be explained and its relations to our topic will be explored. eHealth will give context to how evolution of medical technology gives rise to new security challenges and opportunities. Medical Data will cover the type of information that hospitals and General Practitioners (GP) are handling while the Medical Records section covers how it is stored and handled by said institutions. Data Handling explains the steps hospitals and GPs should take in order to maintain the security and integrity of their patients' data.

### 7.1 eHealth

eHealth is a term that covers the use of information and communication technologies to support health and healthcare (Singhal, 2020). It encompasses a set of concepts such as commerce, health, and technology. Among the different definitions of eHealth, all mention health, and the technologies it involves (Oh et al., 2005). Health is usually referred to in these definitions as the health care process rather than a state of wellbeing. Technology in the context of eHealth is viewed as both a tool to enable an eHealth process or service, and being eHealth itself, as many eHealth services could not exist at all without it (Oh et al., 2005). Rather than being seen as a substitute for traditional health care, eHealth technology is instead commonly portrayed as a tool to assist and enhance health care activities. The commercial aspects of eHealth are rarely mentioned in definitions, and it often only has positive connotations with terms such as low costs, accessibility, enhancing, and efficiency used regularly. None of the definitions suggests that eHealth could have negative or harmful effects. (Oh et al., 2005).

Eysenbach's (2001, p. 1) definition of eHealth is the most commonly cited definition which states that “*E-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and*



*related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology”.*

Electronic medical records are one service that is covered in this definition as “*information delivered or enhanced through the Internet and related technologies*” (Eysenbach, 2001, p. 1). Eysenbach’s (2001) definition is the one we will use since it is clear and emphasizes health services that improve communication and information.

The digital transformation has contributed to improved communication between healthcare professionals such as GPs and specialists with the inclusion of electronic medical records (Eysenbach, 2001). This replaces paper-based patient records with electronic ones which allows for a reduced number of medical errors, reducing costs and quick access to health-related information (Menachemi & Collum, 2011). Electronic prescription allows for printing of prescriptions for patients and electronic transmission from GP to pharmacists. A big advantage this has over paper-based prescriptions is the increase in accuracy and error-free orders and better communication (Lombardi, 2011). Norway has the Prescription Provider, which is a national database of all patient prescriptions. Only the healthcare professionals and pharmacies that are providing the patient with care can see this information (TrinnVis, 2022).

Mobile health (mHealth) is health services, information and data collection supported by mobile devices. This is a sub-segment within eHealth (Adibi, 2015). This allows patients to get consultations even when they can’t visit their doctor physically. Apps are being created with the aim of bridging the gap between patients and doctors, where the patients can ask for advice or care, increasing efficiency for doctors without the need for appointments. This is known as *Telemedicine* (Talboom-Kamp, 2021). These apps can also provide real-time monitoring of patient vital signs. It can be used between practitioners and researchers for delivery and sharing of healthcare information (Pimmer & Tulenko, 2016). Remote healthcare also includes Telerehabilitation, Telesurgery and Teledentistry. Telerehabilitation is the delivery of rehabilitation services over the internet. This is used for many different fields of rehabilitation, but they all typically utilize phone calls or videoconferences to conduct the rehabilitation sessions (Tan, 2005). In recent years, virtual reality has also been used in Telerehabilitation. One example is for musculoskeletal disorders, which includes patients with conditions that affect muscles, bones, or joints. Patient data is uploaded as a video link to the therapist who will prescribe virtual reality-based exercise routines based on the footage. Therapists can then

monitor the progress and give further guidance without the need of any physical interaction (Westwood et al., 2005). Telesurgery is surgery performed remotely with the use of a robot surgical system utilizing arms controlled by the remote surgeon. The combination of robotics and telecommunication allows for worldwide surgeries on patients, freeing up the need for specialized doctors at local hospitals as well as lessening travel needs for both surgeons and patients alike (Intuitive Surgical, 2012). Tele dentistry allows for information and image exchange between dentists and is remotely used for treatment planning and consultation, which also lowers costs for patients (Jampani et al., 2011).

eHealth comes with new user privacy and confidentiality challenges. Data privacy risks due to the increase in personal information stored online requires the implementation of appropriate safeguards for the collection, and handling of user data. Protection against unauthorized access and safe storage of data should be a priority for hospitals (Bennett, Bennett & Griffiths, 2010). Some doctors are resistant to eHealth due to a perceived loss of control over the care process when conducting digital consultations (Talboom-Kamp, 2021). Doctors must be willing to utilize the new eHealth applications for it to have a positive impact. An example of a lack of willingness to adapt can be found in Norway, where many GPs are not utilizing their patient's summary care record that now is stored digitally and can be easily accessed (Kalveland, 2019). This could harm trust in GPs ability to both treat patients and handle their medical data properly.

Our research aims to uncover how much the Norwegian public trust the handling of medical data, which is why understanding eHealth is crucial in order to grasp exactly what they are putting their trust in. It is hard to trust a service in which you have no knowledge of. Electronic medical data being one of those eHealth services has brought is a major contributor to the quality of medical data handling which GPs and hospitals provide and proper use of it would improve patient trust (Oh et al., 2005).

## 7.2 Medical Data

Personal data is information that can be used to identify individuals (i-SCOOP, 2022). Different pieces of data put together can identify a particular person, which makes it valuable and at risk of getting stolen. (European Commission, 2018). The value of personal data is not only limited to identifiable data, but interests and wishes can also be stored and combined with existing data. This data is considered a resource which companies are willing to pay for (Sempf, 2019). Advertisers can use personal data to tailor their advertisements to the needs of potential customers. Online searches are also being stored and remembered, which is known as digital traces. If someone searches for

diapers, advertisers can use this information to target them with ads about baby toys, baby food and parenting books. All this information will be used to paint an overall picture of someone's identity (Sempf, 2019).

Medical Data is health-related personal data that consists of patient diagnosis, severity of ailment, medical history, and treatment information. It also includes the diseases someone has, familial disorders, allergies, which medications they use and how often they use them (Law Insider, 2022). Medical data allows medical practitioners to be up-to-date with a patient's health when treating, advising or diagnosing them. It also allows patients to gain insight into how their health has evolved over time, which increases their understanding of their own body, allowing them to make meaningful lifestyle changes in order to improve their quality of life. Being health literate also allows patients to communicate better with their GP about their health situation.

Medical data is an alluring target for criminals, as it also contains patient name, date of birth, gender, race, social security number, insurance numbers, and credit card information (Vanderburg, 2021). It can be sold on the dark web, be used to make fake medical claims, purchase prescriptions, and receive treatment under a false identity. It is also harder for a victim to stop them once their medical data is leaked compared to a credit card number (Vanderburg, 2021). Medical data cannot be “*canceled*”, while a victim can quickly call and ask their bank to cancel their card and request a new one quickly. This gives a criminal a much larger window to exploit someone's data (Vanderburg, 2021).

Understanding what medical data encompasses is crucial for our research, as it is the level of trust in both the handling and security of said data that is being measured. The Norwegian public needs to understand what medical data is before they can form an opinion regarding the handling and security of it.

### 7.3 Medical Records

The digital transformation has brought great benefits to the healthcare sector. Electronic medical records being one of them which is where patients' medical data is stored. It is a computer-based data system designed to replace paper-based patient records. These records include a complete history of all health-related information on a given person (Kirch, 2008). The electronic medical record system's primary use is supporting health care professionals by offering many benefits, such as a reduced number of medical errors and improved care quality by giving quicker access to patient information. It also reducing costs for GPs and hospitals alike (Menachemi & Collum, 2011). We have two different types of medical records in Norway; The *patient Record* is a local register that is being created and updated by your GP and can only be viewed by local personnel (TrinnVis, 2022). This

data can be transferred if you change treatment location. You also have the right to access the data stored. The *summary care record* is a central register hosted by Norsk helsenett, where critical health information is stored (TrinnVis, 2022). As of 2017, all Norwegian citizens have a personal summary care record (Dyb & Warth, 2018). The purpose is to give healthcare professionals quick access to important information in emergency situations. This data can be accessed by all healthcare professionals if you are acutely ill. GPs can access summary care records without permission. Patients has the right to request not to be registered (TrinnVis, 2022).

Knowledge regarding Medical Records is crucial in order to understand why our medical data is at risk from cyberattacks. Manual filing systems with medical records stored on paper were replaced by electronic medical records to great benefit for the healthcare sector, but it also shifted criminals' focus away from break-in theft at hospitals to cybercrime targeting medical journals online (Marquez, 2021). Another downside of electronic medical records is that it must be learned by health professionals, taking time away from treating patients (Menachemi & Collum, 2011). Storing medical records in a computer-based system allows researchers easy access to patient data, thereby making health research both quicker and possible on a larger-scale (Menachemi & Collum, 2011). While eHealth has benefited healthcare, it has also opened new avenues for exploitation by bad actors as a result of database stored medical data. Staying vigilant of different types of malicious methods used will bolster protection. The protection of Medical Data is constantly at risk from different threats aiming to corrupt or steal data, thus the need for GPs and hospital personnel to be up to date with the newest cybersecurity threats increases (Rosencrance, 2021).

In 2003, there was a dual usage of both electronic and paper based medical records in Norway. Studies showed that this was a contributing factor to limited utilization of electronic medical records by GPs and at hospitals (Lium, 2007). Norwegian hospitals have since then removed paper based medical records. The results showed higher usage of electronic medical records; however, this was mostly for tasks that required the usage of medical records where they would previously use paper based medical records (Lium, 2007). Widespread clinical usage of electronic medical record systems is now standard, but there are still many GPs in Norway that are currently unaware that they can access their patients' summary care record without asking for consent (Kalveland, 2019). The use of the summary care record by GPs when consulting a patient is particularly underused, and there are examples of patients not using the prescriptions a hospital has advised them to use for over a year. The hospital will store this data in their summary care record, but if the GP is exclusively using the Patient record, such critical information will not reach them (Kalveland, 2019).

Several in-depth interviews with Norwegian doctors and GPs on their experiences using summary care records were conducted. Outside of emergency situations, the pharmaceutical summary is generally the only function within the summary care record functionalities that is used. Even this function is primarily used just for a few situations or groups of patients such as unconscious patients, substance abusers, or elderly with multiple prescriptions (Dyb & Warth, 2018). The main reason only this function is used is that it is automatically updated, unlike the other functions which require manual updates that can be inaccurate or lacking in detail. The *Prescription Provider* database in Norway provides these automatic updates which can be viewed in the summary care record. It can then be concluded that summary care records are underused because medical practitioners lack trust in manually updated information. Increasing trust in summary care records by somehow turning manual information into automatic information is vital for the future success of summary care record usage (Dyb & Warth, 2018).

It would be understandable that some patients are worried about the security and handling of their medical data if they knew that GPs and medical practitioners at hospitals also worry about the accuracy of manually updated information. If medical practitioners themselves are distrustful towards medical records, it would be hard to convince patients that they can trust their handling of medical data utilizing said service. Understanding this dilemma is important for our research, as it could explain some of the trust related results in our survey.

## 7.4 Data Handling

Data handling could be considered a collective of services provided by GPs and hospitals for their patients. The different components of data handling cover various services done with patients' medical data. It aims to provide a satisfactory service and to prevent the exploitation of their data by cyberattacks. The handling of medical data includes both its usage by medical practitioners and utilization in eHealth services. Service quality and its perceived value has a positive effect on satisfaction, although the various services data handling encompasses could have varying degrees of effect on satisfaction (Lai, 2004). There is already a substantial amount of research on the relationship between service quality and satisfaction, which is considered positive and significant (Lai, 2004). Data handling is the type of service that often goes unnoticed unless the quality is poor. An example of this is hospital security against cyberattacks. Poor data handling service will have a negative effect on satisfaction, which implies that it can also have the opposite effect when the service is good.

Medical data became more secure and less prone to get misused by unauthorized personnel when medical journals went from being paper based to electronically stored in a database (Irwin, 2018). Norsk helsenett hosts the central database for all medical data in Norway. They have connected GP

and Hospital journals together, but they only store the most critical data for the patient in a system called core journal (Helsenorge, 2018).

Everybody that has a registered address, and a Norwegian personal number gets a user on the core journal by default. The data that is not life threatening, is still stored locally at GP's and Hospitals and not sent over to the main network. If a consumer decides to change their GP or hospital, they can notify their old facility and ask them to transfer their journals to the new location. All hospitals in Norway, including emergency departments, have access to core summary records. The most common usage of core medical records is in emergency departments (Helsenorge, 2018).

GP uses a journal that is stored at the local medical office and is updated every time you have an appointment. All journals are classified with duty of confidentiality and only employees that are treating the patient are allowed to have access to the journal. Norsk helsenett only shows information from the hospital's summary care record and does not include data from a GP's patient record (OsloMet-storby universitetet, 2017).

Hospitals use the information they collect about a patient to treat their ailment or sickness. They also utilize the data about patients to manage what type of healthcare the patients receive, as well as provide information to the medical staff that work on a health bus, which transports patients between hospitals. In the case of an emergency onboard the health bus, the medical staff can access journals with crucial information about the patient (Helse Stavanger, 2019). The data that is stored on a patient can be used to oversee medical care they receive for quality control or can be used if a patient has a complaint about their stay and treatment, as they log everything connected to the patient. Hospitals may use saved patient data to conduct research, but the patient must consent to the participation in the research project beforehand. All patients can check who have opened their core journal, and patients have the option to block the access of specific healthcare professionals from their journal. Patients can also request to have their data deleted or not used by Norsk helsenett at all, but this is a process that takes up to 30 days (Helsenorge, 2018). They can also contact Norsk helsenett support when they want to reopen their core journal. Hospitals can also check patient personalities, family members, patients' GP, overview of medications, critical information, data about allergies, contact person, and diagnoses made outside the hospitals (Helse Stavanger, 2019). Data handling is an umbrella-term for each service that is being provided by GPs and hospitals, and trust in each of these services will be measured during our research.

## 7.5 Data Security

Norsk helsenett uses a department called “*HelseCERT*”. HelseCERT is the national cyber security center for the health and care industry. HelseCERT states that “*Patient safety is increasingly dependent on ICT security. Digital attacks can cause downtime on critical systems. The biggest external threats are denial of service attacks from the internet and ransomware viruses that encrypt large file areas.*” (Norsk helsenett, n.d., para. 1). Examples of attacks that HelseCERT is worried about and working against is Malware that is widely spread, fraud attempts, industrial espionage, value chain attack.

HelseCERT has listed six safety measure guidelines, first being application whitelisting. This is a process of approving safe applications. This is commonly done by giving employees access to a locked and restricted client where only the pre-approved applications are available (HelseCERT, 2021). The second safety measure is email security, which encourages GPs and Hospitals to install Domain Message Authentication Reporting and Conformance (DMARC) and Sender Policy Framework (SPF) to their domain, to ensure that emails can only be sent by the GP or the employees that work at the hospital. DMARC is a safety mechanism that is used on domains (HelseCERT, 2021). The SPF works by locking out emails that are being sent from unapproved IP-addresses. The third safety measure being client security, which states how to fight cyberattacks on clients. Upgrading software and firmware, installing safety updates immediately, avoiding giving end users administrator rights and blocking all non-authorized applications from running on the client. The fourth out of the six security measures being stronger passwords, where they suggest that employees take security courses to avoid being tricked by phishing attacks (OsloMet 2017). They also advise against reusing passwords and not use simple and weak passwords that can be easily guessed. The fifth security measure is fraud countermeasures, this is where the attacker tries to pretend that they have a relation to the victim to get information or financial gain. HelseCERT advises employees to take a scam course to avoid being tricked into giving out sensitive information resulting in financial losses (HelseCERT, 2021). The sixth one being vulnerability scan, where vulnerabilities in the networks such as an outdated operating system, lack of security updates and reusing an administrator password gets exposed by using scanning tools such as Open Web Application Security Project (OWASP) (Lynch, et al., 2021).

These six points are safety recommendations to make sure the system of the user is secure from attacks. One of the biggest threats is Phishing, which is a network assault in which an attacker produces a phony version of an existing webpage in order to trick an internet user into divulging personal information (Gupta, et al., 2016). There are also those who steal medical data from hospitals

and blackmail them into paying a ransom fee for their patients' data. These types of attacks are called ransomware-attacks (Rosencrance, 2021). To help GPs and hospitals handle these threats, HelseCERT has created this guideline list on how to protect data from attackers (HelseCERT, 2021).

Norsk helsenett provides a secure digital environment for all healthcare stakeholders to communicate and exchange personal and patient data in a secure and legal manner (Helsenorge, 2018). Norsk helsenett does also have other third-party companies that host services for them, but the companies that are collaborating are going through constant risk assessment on data security. The provider must look at security threatening situations, how they may influence the service, and what steps to be put in place to mitigate them throughout the risk assessment. The third-party suppliers are the main Norwegian internet providers and Norwegian hospital partner (Helsenorge, 2018).

Our research looks at data security to understand how GPs and hospitals maintain or how they should maintain integrity and security of patient medical data. How much the Norwegian public trusts the security of their medical data is determined by how well medical practitioners can follow these steps provided by Norsk helsenett.

## 8 Hypothesis

This section provides testable hypotheses linked to the research question. It establishes the variables; Norwegian public, satisfaction, worry, and trust. Satisfaction is first defined and then viewed in context of our topic, which leads to a hypothesis being generated with that knowledge in mind. The second section does the same for worry including distinguishing it from other synonyms. Then trust is presented including definitions and the one we will be utilizing going forward. The impact satisfaction has on trust is then explained with the third hypothesis assuming a positive relationship between the two. Worries impact on trust is then presented which assumes that worry negatively impacts trust. Lastly, a hypothesis framework is included to visualize our hypotheses

### 8.1 Satisfaction

Satisfaction is difficult to define, since there are so many different things that can make a person satisfied. Because people are built differently, they acquire satisfaction in different ways. Some people get satisfied easily, while others require a lot more work to have the same level of satisfaction (Ackerman et al., 2022). Satisfaction can come from positive situations resulting in a sense of happiness, or an accomplishment. To gain a patient's loyalty or trust, satisfaction through quality of service is required (Wonder et al., 2021). To increase satisfaction, the medical practitioners must provide a sense of security to their patient by empathizing with their emotions. If a problem has



occurred or services have been lacking, the GP or the hospital needs to take responsibility and acknowledge their mistakes to the patient, otherwise risking significantly reduced satisfaction (Wonder et al., 2021). Without satisfaction, trust have nothing to build upon. Satisfaction with a service builds loyalty, which in turn increases trust (Picón et al., 2014).

Satisfaction can be divided into four levels, first one being satisfying patient expectations, second one being exceeding patient expectations, third being to gratify your patients and lastly being to amaze your patients. Patients' expectations means if the service from the provider meets the expectation of the consumer. Level two being exceeding patients' expectations. This means that the medical practitioners' find alternative ways to keep the patients happy (Kshatriya, 2021). Gratifying patients is level three, which means that their basic needs are exceeded, but it also implies that the service quality of the hospital or GP have resonated with them. It would take a lot for a patient to switch GP if their level of satisfaction is at this stage. The fourth and last level satisfaction is amazing your patients with a service. This can only be reached by GPs and hospitals that thrive to satisfy their patients above all else. They usually listed to feedback and makes an active effort into improving. New equipment that improves quality of service will usually result in positive feedback (Kshatriya, 2021).

We will utilize Steele et al., (2002)'s definition of satisfaction since it accurately captures the link between patient satisfaction and high quality of service. The study from Steele et al., (2002) shows that there is a connection between satisfaction, loyalty and quality of service (Steele et al., 2002). Medical network is defined as the whole system that is holding sensitive information of patients. An online survey was conducted on the usage of patient-accessible electronic health records. 1037 Norwegian respondents who had accessed their electronic health record online participated. Patients were very satisfied with the usefulness of this service which also allows for tracking of hospital appointments, treatments and sharing of documents. They also felt that this eHealth service increased security and allows for better communication with healthcare providers and their GP (Zanaboni et al., 2020). Based on this, the following research hypothesis can be prepared:

*H1 - The Norwegian public are Satisfied with the treatment of their medical data*

## 8.2 Worry

In this thesis, we will use the concept of “worry” to measure how much it impacts trust towards Norwegian GPs and hospitals. Worry is an emotion that arises when a person feels uneasy or concern about current or impending challenges. When you worry too much, reason will begin to falter, and will start focusing on “*what may go wrong.*” (Bruce et al., 2008). Chronic worry will have a negative impact on everyday life, since it can influence eating habits, lifestyle choices, relationships, sleep, and work performance (Bruce et al., 2008). Worry has a rational component to it. Your brain is attempting to make sense of a real-world threat. It is understandable to be concerned when your worries are manageable. Anxiety, on the other hand, exaggerates the danger. To make matters worse, people who are anxious may underestimate their capacity to handle an unfavorable situation (Henry Ford Health Staff, 2020). Even though many of us intuitively understand that concern makes us nervous and sad, research demonstrates that we nevertheless become worried when dealing with difficulties. One reason for this behavior is that the brain prepares us mentally for unpleasant situations and results (Pace, 2020).

Being concerned is often used interchangeably with the term “*worried*”, but there are differences between the two. For example, thinking “What if the dentist finds dental cavities?” is being worried, while thinking “I better brush my teeth more often to avoid having dental cavities” is being concerned. Concern is focused on problem-solving, while worry implies a lack of control (Luciani, 2019). Another term that is related to worry and concern is stress. When people are under pressure or threatened, they often experience stress. Stress is a state of mental or emotional strain resulting from adverse circumstances. Anxiety can often arise when under stress. One example of stress being built is when work deadlines keep piling, increasing the feeling of anxiety. Fear, dread, and uneasiness are all symptoms deriving from anxiety (Brosschot, et al. 2006).

There have been issues with Norsk helsenett in the past, where patients have gained access to other patients’ sensitive data on their own medical record. When this got spread out to newspapers, people started to worry about the safety of Norsk helsenett (Knudsen, 2016). A survey from 2021 showed that 22% of people felt their data was safe in 2020. In 2021 the percentage increased to 41%. This is a big increase of the safety within Norsk helsenett and means that more people do not worry about their sensitive medical data (Forskningsrådet, 2021). Based on this, the following research hypothesis can be prepared:

*H2 - The Norwegian public are not Worried about the treatment of their medical data*

### 8.3 Trust

In this thesis, "trust" will be used to quantify how much faith individuals have in their hospitals' and GPs' competence or desire to appropriately manage and secure their medical data from cyberattacks. Trust as a concept may be split into three stages of development: trust building, which is the process of generating trust; stabilizing trust, which is the process of maintaining trust; and dissolution, which is when trust has been broken (Kautonen & Karjaluoto, 2008). We believe that satisfaction and a lack of worry will contribute to the trust building process and during the stabilization phase. When worry grows and satisfaction with GPs and hospitals lessens, the dissolution phase will begin, and the trust people have in these institutions will do the same.

Defining trust is challenging, as there are dozens of definitions specified for certain contexts. It is often associated with reliability, integrity, dependency, and responsibilities imposed on someone (Kautonen & Karjaluoto, 2008). It is also misconstrued and used interchangeably with other terms such as cooperation, faith and reliance. Cooperation is what might happen once trust has been established, although it does not necessarily mean that a cooperation includes trust. Faith is about belief and does not include reasoning unlike trust (Corritore et al., 2003) Relying on someone may be done with or without trust, hence why it does not imply a level of trust between two parties (Blois, 1999). Trust is both an emotional and logical act (Straker, 2010). The emotional component stems from revealing your vulnerability to people believing they will not take advantage of your openness. Logic is involved when you assess the probability of gain and loss from trusting the individual in question. People frequently place their trust in others since they have experienced their trustworthiness and have faith in their character (Straker, 2010). Sharing a vulnerability while having trust in someone's trustworthiness comes with a risk, whereas an agreement with the trustee demonstrates a lack of control over their actions. As a result, it is reasonable to conclude that trust entails both risk and lack of control.

A very popular definition of trust is: *"Trust is the willingness of a party to be vulnerable to the action of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party"* (Schoorman et al., 1995, p. 712). It is implied with this definition that by being vulnerable, something of value can be lost by the trustor. The inability to monitor or control the trustee demonstrates the lack of control a trustor has while putting trust in someone (Corritore et al., 2003). Another definition defines trust as *"the belief that the trusting Agent has in the trusted Agent's willingness and capability to deliver a quality of service in a given context and in a given Timeslot"*. This is a context-specific definition which excludes concepts such as vulnerability and lack of control (Chang et al., 2005, p. 3). When

defining trust, literature frequently splits trust into *reliability trust* and *decision trust*. When a trustor relies on a trustee to fulfill a duty that is critical to the trustor's well-being, this is referred to as a reliability trust. This term encompasses both dependability and dependency. (Gabetta, 2000). Decision trust is defined as “*the extent to which one party is willing to depend on something or somebody in a given situation with a feeling of relative security, even though negative consequences are possible*”. This term incorporates dependability, trust, and risk. (McKnight & Chervany, 1996, p. 27).

Going forward, we will be using the Schoorman et al (1995) definition of trust going forward, as it accurately describes the relations between a patient and the medical personnel who have access to their medical data. A patient will be unable to monitor a hospital or a GPs handling of medical data (Irrespective of the ability to monitor or control that other party), and they will also be vulnerable since personal information is being handled by a third party (Willingness of a party to be vulnerable to the action of another party).

## **8.4** **Satisfactions impact on Trust**

Satisfaction with a product often leads to brand loyalty. Loyalty to a product implies that a customer also trusts that the product will fulfill the expected needs of the customer (Gul, 2014). This relation also applies in a healthcare setting. When a patient is satisfied with their GP, they will start to trust them as they have come to expect a certain level of quality from their service. If satisfaction grows and worry decreases the trust variable will grow stronger as a consequence (Steele et al., 2002). Geyskens et al. (1999) claims that satisfaction is an antecedent to trust, meaning that you cannot trust something without being satisfied with it to some degree in the first place. On the other hand, Gul (2014) contradicts this and proposes that trust precedes satisfaction. It argues that there are other factors that will influence someone's trust in a service before they even try it for themselves. Therefore, it can be assumed that there is a bi-directional relationship between satisfaction and trust. Satisfaction is still considered to be the predictor of trust where the satisfaction of a product or service will eventually lead to trust of the provider (Gul, 2014).

Providing top-notch service quality will contribute to gaining a patient's trust. Exceptional service quality demonstrates compassion and a commitment to the interests of the patient. Providing good patient consultation and advice will satisfy patients, since it will show them that the GP or medical practitioners at hospitals are patient and care enough to walk them through any issues they might have. Letting them know that they are in good hands is what trust is built on. Transparency and honesty also contribute to trust since it lets patients know that they are not being tricked, allowing them to feel safe (Fuchs, 2022). Based on this, the following research hypothesis can be prepared:

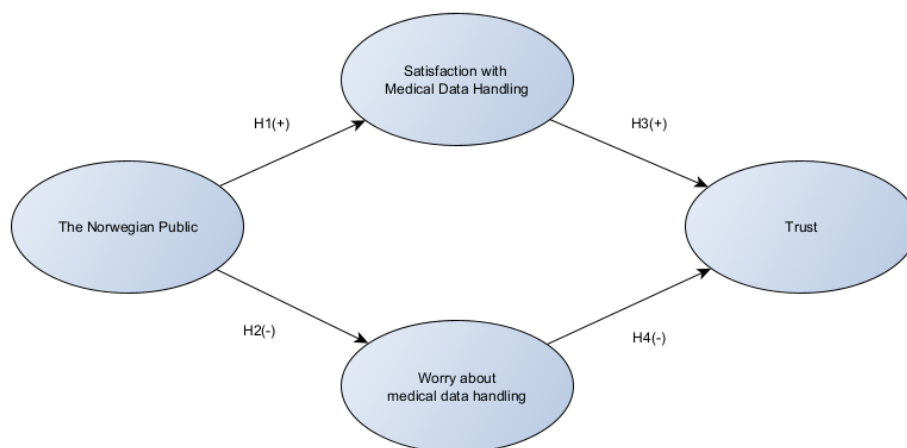
*H3 - Patient Satisfaction has a positive impact on Patient Trust*

## 8.5 Worries impact on Trust

Worrying stems from having negative attention towards someone or something. It can cause stress and the more mental capacity is spent on it, the more it will build up. An example of the impact worry has on trust can be found in the reactions to the handling of the global Coronavirus pandemic. This virus caused a pandemic which is now commonly named COVID-19 (John Hopkins Medicine, 2022). “*Stress and worry in the 2020 coronavirus pandemic: relationships to trust and compliance with preventive measures across 48 countries in the COVIDiSTRESS global survey*” by Lieberoth et al, (2021) Looks at how worry over the COVID-19 pandemic can affect and be affected by their trust in government’s efforts. It shows that Participants from Norway were more concerned over the pandemic compared to other countries outside of Europe and had a lower trust in their governments efforts to stop its spread. It also concluded that the more trust people had in government efforts to slow the spread of COVID+19, the less stress and worry were experienced. (Lieberoth et al., 2021). The implications are that there is a bi-directional relationship between worry and trust, where increased worry leads to less trust, and more trust leads to less worry. Based on this, the following research hypothesis can be prepared:

*H4 - Patient Worry has a negative impact on Patient Trust*

## 8.6 Hypothesis Framework



*Figure 1: Framework model for Hypthesis*

This Framework Model illustrates our different Hypotheses. We hypothesize in H1 that The Norwegian Public are *satisfied* with the handling of their medical data. H2 predicts that The Norwegian Public are not *worried* about the handling of their medical data. H3 speculates that *satisfaction* has a positive impact on *trust*, while H4 assumes *worry* has a negative impact on *trust*.

## 9 Research Methodology

In this thesis we investigate “*How much does the Norwegian Public trust in the handling and security of their medical data?*”. There are a limited number of surveys conducted in Norway on the amount of trust Norwegians have in medical data handling and security. This leaves room open for interesting findings and could provide suggestions to GPs and hospitals as to where and what they should improve on in order to increase patient trust. Other researchers would also find the results interesting, since understanding patient trust in Norwegian health services could be utilized both in practice and further research. There are some earlier research on a similar research problem in Norway, like “*Dobbelt så mange føler seg trygge på sikkerheten til egne helsedata*” which mainly focuses on worry regarding data security (Forskningsrådet, 2021). We chose to use a quantitative method approach because a large sample size would be the best to get a reliable estimate of the Norwegian public’s consensus. A survey utilizing a Likert scale gives us a way to measure levels of trust, which suits our thesis well. A qualitative approach could have been used to acquire in-depth answers, but this would increase the estimated completion time of our survey which would decrease the number of willing participants. Qualitative surveys or interviews would also take more time to analyze compared to a quantitative survey.

### 9.1 Data Collection

A quantitative approach utilizing a survey was the source of data collected in this study. We initially used Google Forms for the creation and hosting of our survey but moved it to Nettskjema.no to avoid google tracking tools. Nettskjema has the option to not collect any sensitive personal data from the participants, therefore we did not apply to NSD due to us and nettskjema not collecting sensitive personal data. NSD ensures that data on individuals and society may be gathered, kept and shared in a secure and lawful manner both now and in the future (NSD, 2020). It was made clear that anonymity was ensured by following GDPR with a clear explanation of how the results would be used. We also made sure that all respondents can access the data we have about them, the right to delete the data, the right to restrict processing of the data and so on (Wolford, 2019). Our survey contains forty-five questions where we ask about the Norwegian public's satisfaction, worry and trust in cybersecurity and handling of medical data by hospitals and GPs. The questionnaire used Likert scale questions with dependent variables from 1 to 5. A couple of questions also allowed the participants to write the answer. We also added “*Yes*”, “*No*” and “*Don’t know*” questions. The survey we sent out got 155 respondents, which is not enough to have a statistically significant analysis from an opinion survey. However, a sample size of 163 is advised for populations above 20 000 if the confidence level is 80%.

A survey aiming for 95% confidence level should have a sample size of 377 (SurveyMonkey, n.d.). We shared our survey through the social media platform Facebook and on Discord, which is a chat application.

## 9.2 Data Analysis

The data analysis started with using the data collected from our questionnaire using a quantitative research method where we used IBM SPSS Statistics to analyze our data. Professor Sørenbø (2021) from University of South-Eastern Norway, Campus Ringerike, made a guide paper named “*SPSS An introduction to quantitative data analysis with SPSS-24.0*” with guidelines which we followed. After we received 155 responses, we closed the survey from “*Nettskjema*” and downloaded the Tab-separated text file that they provided and then exported it to IBM SPSS Statistics. We used SPSS to analyze the results from our questionnaire. The collected data was then checked in SPSS for missing and non-valid data for research. There were a few missing answers in the survey. Since we wanted to merge multiple questions into categories, we had to calculate the mean result from each statement question for every category. We measured the frequencies of answers for each Likert scale option and illustrated them in bar charts. We also used 2x2 ANOVA analysis to test the effects of two different independent variables on a dependent variable. We used regression analysis to analyze the relationship between satisfaction and trust, and we did the same for worry and trust. The results from the regression analysis were illustrated in a scatterplot chart with all statements questions regarding satisfaction or worry combined, while the combined trust questions were used on the other axis. The R-squared linear value to measure the spread of answers has also been displayed on the scatterplot figures. Correlation, validity, and the significance of the data was then measured, and Sig. 2-tailed was used to tell if the correlation of the regression analysis was significant at a certain alpha level.

## 9.3 Validity

The validity in our survey questions went through testing after we found similar research done in other nations. The Likert scale questions were a good question approach to measure levels of satisfaction worry, and trust in our survey. The question used were inspired by another survey from the EU about the medical network in the Baltic nations (Human Dynamics, n.d.). We used similar questions in a Norwegian context that better fit our topic. The answers we gathered from the respondents can mainly be used for further research in Norway since the survey was only sent out to Norwegian participants. We found results that connect our hypothesis to our research question. Based on earlier studies, we knew that there were many distrustful people regarding the Norwegian Medical Network (Forskningsrådet, 2021). We expected that trust negatively changed

due to the COVID-19 pandemic, and that the Norwegian public may have less trust in the health sector than they did prior. The validity test of our collected data was 0,642 in (Table 1) which means as stated by George and mallery (2003) that the results are between questionable and acceptable.

Table 1: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,642	,672	39

The closer the coefficient is to 1.0, the stronger the internal consistency of the scale's variables (items). (U.I.T.S, 2018). The Case Processing Summary shows in (Table 2) that the analysis excluded nine respondents from our data.

Table 2: Case Processing Summary

		N	%
Cases	Valid	146	94,2
	Excluded <sup>a</sup>	9	5,8
	Total	155	100,0

a. Listwise deletion based on all variables in the procedure.

## 9.4 Limitations

This research approach had some limitations. One being the sample-size, which could have been larger, but since we have a small social group, we had to rely on websites such as Facebook to gather participants among our friends and their friend circles. This also led to some categories such as age groups having an empty option (men 35-44). We should have sent the survey out earlier so that we could use the extra time to find new avenues to gather more participants. Another limitation was the limited time we had to complete our thesis, which lasted for one semester. We also realized after we closed down the survey that we should have changed the wording of questions/statements and added “*don't know*” options instead of allowing for blank answers, which led to us not knowing the meaning behind some of the answers in our data set. A limitation we encountered was that the university server went down occasionally in the evenings or closed down altogether at nights, which made our SPSS statistics program crash or shut down. This caused us to use more time to retrieve lost work and forced us to delay certain tasks.



# 10 Results

## 10.1 The Norwegian Public Are *Satisfied* With the Treatment of Their Medical Data

The Clustered Bar Chart (Figure 2) displays a large number of responders picking neutral on all three statement questions. The results from the survey in (Table 3) shows that almost half of the respondents answered neutral on the Likert scale on the three different satisfaction topics related to GPs Statements. *"Handling of my medical data"* and *"Rights regarding the handling of my medical data"* have both half of the respondents answering neutral, while *"Transparency on how my medical data is used"* have their answers more spread out among the different options while having a neutral percentage closer to 40 percent. There are no clear answers as to whether or not the Norwegian public is satisfied with *"Transparency on how my medical data is used"* since the spread of answers is so even, although it would appear that they are slightly satisfied on average. This statement question also has the highest number of negative answers compared to the other ones. The Norwegian public is satisfied with the *"Handling of my medical data"* by their GPs as predicted in the hypothesis, since the positive answers combined amount to 40 percent of the responses while the negative ones are just slightly over 10 percent.

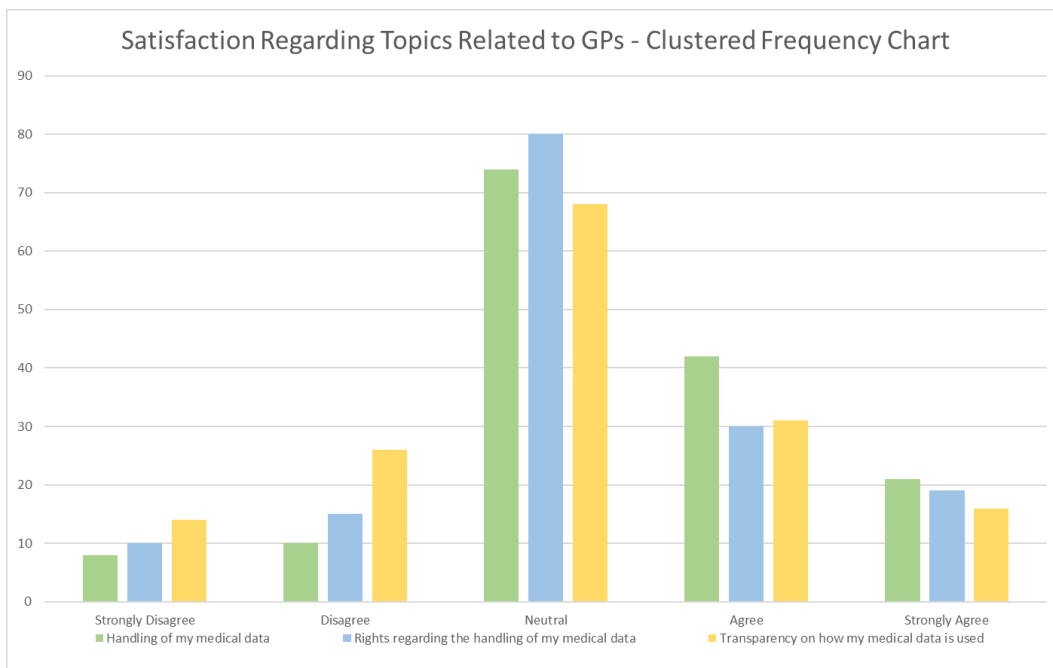


Figure 2: Satisfaction Regarding Topics Related to GPs

Table 3: Satisfaction Regarding Topics Related to GPs

	Satisfaction Regarding Topics Related to GPs											
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Handling of my medical data	8	5,2%	10	6,5%	74	47,7%	42	27,1%	21	13,5%	155	100,0%
Rights regarding the handling of my medical data	10	6,5%	15	9,7%	80	51,9%	30	19,5%	19	12,3%	154	100,0%
Transparency on how my medical data is used	14	9,0%	26	16,8%	68	43,9%	31	20,0%	16	10,3%	155	100,0%
Mean	11	6,9%	17	11,0%	74	47,9%	34	22,2%	19	12,1%	155	100,0%

Satisfaction Regarding Topics Related to hospitals shows an overwhelming amount of neutral answers in (Figure 3). Over half answered neutral on average as can be seen in (Table 4) while certain statements questions had almost as close to 60 percent neutral answers. Positive responses to the hospital satisfaction statements had a similar percentage across all of them. *“Datasecurity at Norwegian hospitals”* was a slight outlier with lower number of positive answers compared to the other question statements. The missing positive answers to *“Datasecurity at Norwegian hospitals”* were instead noticed among strongly disagree and disagree. Satisfaction with *“Datasecurity at Norwegian hospitals”* could be considered slightly negative, which contradicts our hypothesis. *“Transparency on how my medical data is used”* has a very even distribution across both the negative and positive answers on the scale. This also applies to the other question statements, suggesting that our hypothesis was wrong regarding hospitals since the Norwegian public are neither satisfied nor dissatisfied.

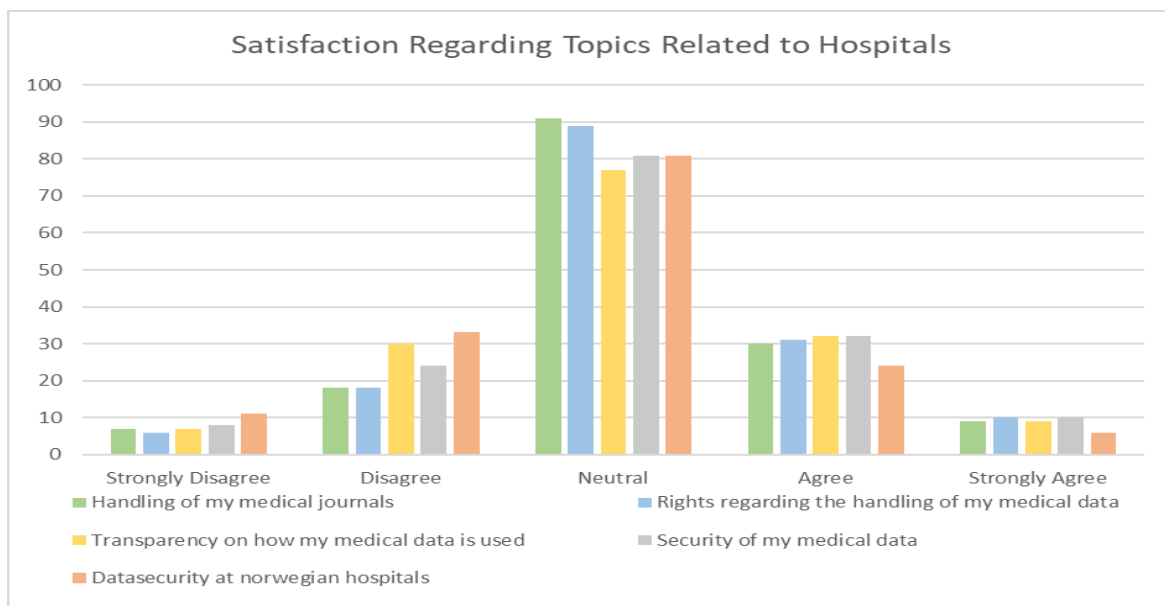


Figure 3: Satisfaction Regarding Topics Related to Hospitals Graph

Table 4: Satisfaction Regarding Topics Related to Hospitals Table

	Satisfaction Regarding Topics Related to Hospitals											
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Handling of my medical journals	7	4,5%	18	11,6%	91	58,7%	30	19,4%	9	5,8%	155	100,0%
Rights regarding the handling of my medical journals	6	3,9%	18	11,7%	89	57,8%	31	20,1%	10	6,5%	154	100,0%
Transparency on how my medical data is used	7	4,5%	30	19,4%	77	49,7%	32	20,6%	9	5,8%	155	100,0%
Security of my medical data	8	5,2%	24	15,5%	81	52,3%	32	20,6%	10	6,5%	155	100,0%
Datasecurity at norwegian hospitals	11	7,1%	33	21,3%	81	52,3%	24	15,5%	6	3,9%	155	100,0%
Mean	8	5,0%	25	15,9%	84	54,1%	30	19,3%	9	5,7%	155	100,0%

(Figure 4) shows that the marginal mean is over 3,00, which is neutral. There were no males in the age group between 35 to 44 answering the survey. The marginal mean is calculated by taking the value from what the women and men replied and dividing it by the number of statements in our survey. It shows that women over 65 are more satisfied with their GPs handling and security of their medical data compared to men in the same age group. However, this trend did not repeat in the other age groups with each age group changing between which gender is the most satisfied. This also indicates that Norwegians are slightly satisfied with the GPs handling and security measures regarding their medical data.

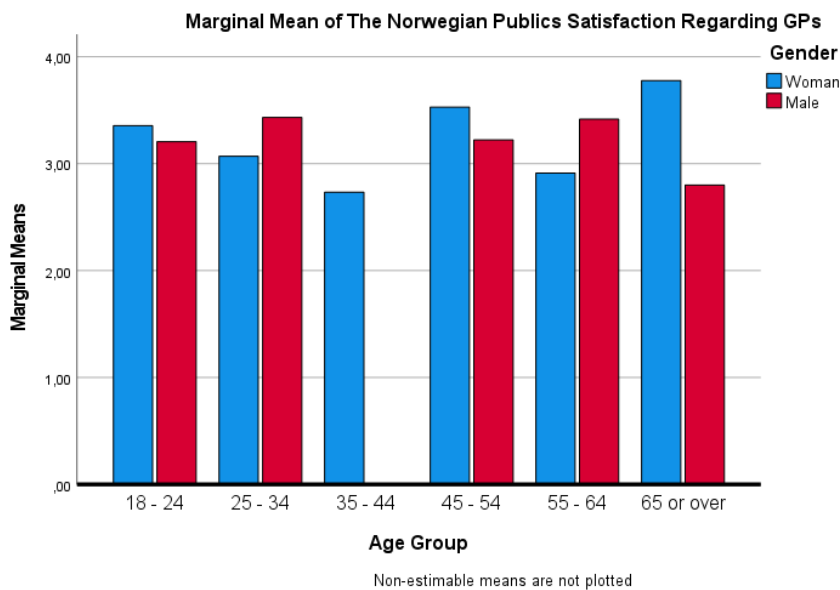


Figure 4: Marginal Mean of The Norwegian Publics Satisfaction Regarding GPs

The ANOVA analysis in (Table 5) shows the satisfaction variables which have been combined to a mean value. When we run the ANOVA test, we get the answer that says our Sig. is a 0.562 which means that since it is over 0,5/5%, the relationship is not statistically significant (Sørebø, 2021). Due to the results being not statistically significant we did not run any post hoc test. The post hoc tests are used in the same way that ANOVA is used, instead of multiple t-tests to control the experiment wise error rate.

Table 5: GP Satisfaction Anova

Combined Satisfaction with GP		ANOVA			
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,952	2	,476	,579	,562
Within Groups	125,057	152	,823		
Total	126,010	154			

### 10.1.1 Summary of Hypothesis 1

We hypothesized that *"The Norwegian public are Satisfied with the treatment of their medical data"*. While 34,3% are satisfied compared to 17,9% being dissatisfied with their GP, it doesn't mean that they are satisfied with each aspect of GP treatment of medical data. It can't be said that the Norwegian public are slightly satisfied with the transparency on how their medical data is used by GPs since as many as 25,8% are dissatisfied compared to 30,3% answering positively. The mean of neutral answers for the different GP statements are 47,9%, meaning that almost half of the respondents neither disagree nor agree that they feel satisfied with their GPs treatment of their medical data. Satisfaction with the handling of medical data is apparent, with 40,6% answered either agreeing or strongly agreeing, while only 11,7% of respondents had a negative answer. The results from the satisfaction statements regarding hospitals are less positive compared to the ones from satisfaction regarding GPs. 22% are satisfied with their hospitals' treatment of their medical data and its security, while 20,9% are dissatisfied. The amount of neutral answers is even higher compared to the GP related statement questions. The mean of neutral satisfaction regarding hospital answers is at 54,1%. We can conclude that Norwegians on average slightly agree that they feel satisfied with their GPs treatment of their medical data, while they are neither satisfied nor dissatisfied with their hospital's treatment of their medical data.

## 10.2 The Norwegian Public Are Not Worried About the Treatment of Their Medical Data

The survey results illustrate in (Figure 5) a big spread of answers among the five different statement questions. An outlier is worry about the “*Lack of Cybersecurity knowledge*” among GPs, which has an overwhelming amount of positive worry answers compared to the other question statements. It also has the lowest amount of negative worry answers, suggesting that our hypothesis was wrong at least for “*Lack of Cybersecurity knowledge*” regarding GPs. Worrying about the “*Handling of my medical data*” has the highest percentage of neutral answers and is also the statement the Norwegian public is the least worried about, which is in line with our hypothesis.

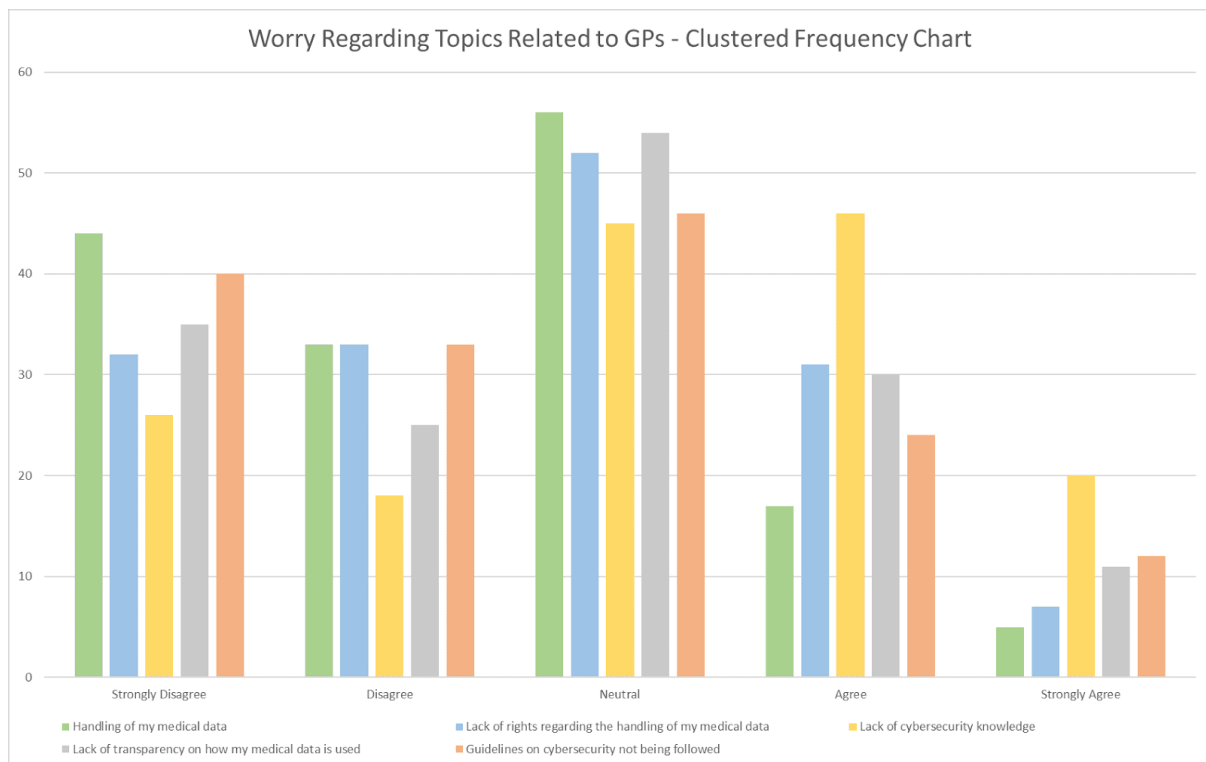


Figure 5: Worry Regarding Topics Related to GPs - Clustered Bar Chart

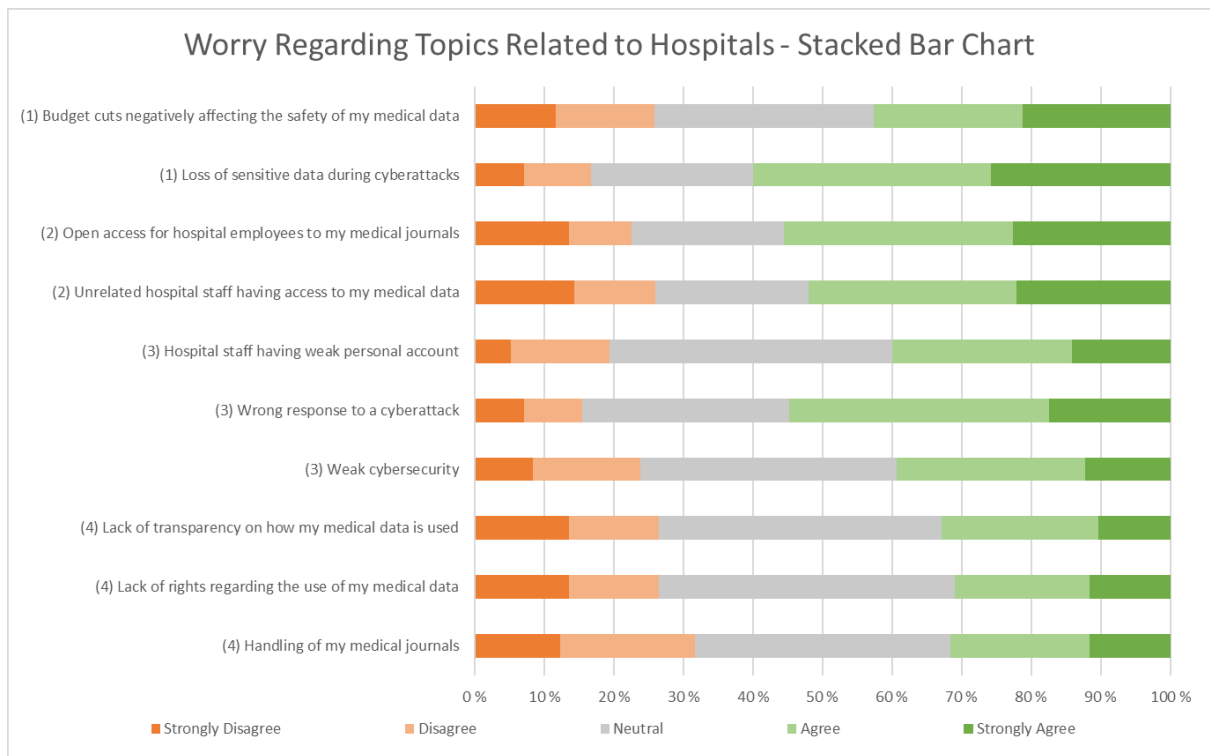
(Table 6) displays the mean of neutral answers is almost 30 percent. which is substantially lower than the results from satisfaction with medical data treatment, which were around 50% for both GPs and hospitals. The Norwegian public is in general not that worried about “*Lack of rights regarding the handling of my medical data*” since 40 percent gave negative answers on the Likert scale compared to over 20 percent of positive ones. “*Lack of transparency on how my medical data is used*” and “*Guidelines on cybersecurity not being followed*” also have a large percentage of negative responses. They have fewer positive responses about their worry regarding GP treatment of their medical data compared to the negative ones. Most of the results from the statement questions conclude that the

Norwegian public are not worried about the treatment of their medical data by GPs, the only exception being “Lack of Cybersecurity knowledge”.

Table 6: Worry Regarding Topics Related to GPs

	Worry Regarding Topics Related to GPs											
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	Count	Table N %	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Handling of my medical data	44	28,4%	33	21,3%	56	36,1%	17	11,0%	5	3,2%	155	100,0%
Lack of rights regarding the handling of my medical data	32	20,6%	33	21,3%	52	33,5%	31	20,0%	7	4,5%	155	100,0%
Lack of cybersecurity knowledge	26	16,8%	18	11,6%	45	29,0%	46	29,7%	20	12,9%	155	100,0%
Lack of transparency on how my medical data is used	35	22,6%	25	16,1%	54	34,8%	30	19,4%	11	7,1%	155	100,0%
Guidelines on cybersecurity not being followed	40	25,8%	33	21,3%	46	29,7%	24	15,5%	12	7,7%	155	100,0%
Mean	35	22,8%	28	18,3%	51	32,6%	30	19,1%	11	7,1%	155	100,0%

(Table 7) categorizes the different statement questions from the stacked bar chart into five different categories. The mean of each category and its percentage is then presented. It shows that over half of the Norwegian public are worried about the safety of their medical data at their hospital. The Stacked Bar Chart (Figure 6) illustrates that the “Loss of sensitive data during cyberattacks” is a bigger worry for the Norwegian public in this category compared to “Budget cuts negatively affecting the safety of my medical data”. The respondents are worried about the topics in the first category, which is the opposite of what we hypothesize. The second category also shows that the Norwegian public are worried about who can access their medical data at hospitals. For the third category, over 40 percent are worried that the cybersecurity at their hospital is too weak compared to only 20 percent who are not worried. Hospitals having the “Wrong response to a cyberattack” is the biggest worry, while respondents are more neutral while still worried towards “Hospital staff having weak personal accounts” and “Weak cybersecurity at hospitals”. The three first categories all dispute our hypothesis, which predicts that the Norwegian public are not worried regarding their hospitals. The Norwegian public are generally neither worried, nor unworried regarding the handling of their medical journals at hospitals, which is the fourth category. It has a very even spread of answers across all the options.



*Figure 6: Worry Regarding Topics Related to Hospitals - Stacked Bar Chart*

*The numbers before the statement questions shows which category the statements belong to in (Table 7)*

*Table 7: Mean of Worry Statements Regarding Topics Related to Hospitals*

	Mean of Worry Statements Regarding Topics Related to Hospitals											
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	Mean	Percent	Mean	Percent	Mean	Percent	Mean	Percent	Mean	Percent	Mean	Percent
Statements regarding the safety of medical data	15	9,4%	19	11,9%	43	27,4%	43	27,7%	37	23,5%	155	100,0%
Statements regarding who can access to medical data	19	12,4%	16	10,4%	34	22,0%	49	31,4%	35	22,3%	155	100,0%
Statements regarding weak cybersecurity	11	6,9%	20	12,7%	55	35,7%	47	30,1%	23	14,6%	155	100,0%
Statements regarding the handling of medical journals	20	13,1%	23	15,1%	62	20,6%	32	20,6%	17	11,2%	155	100,0%
Mean	16	10,4%	19	12,5%	48	26,4%	43	27,5%	28	17,9%	155	100,0%

(Table 8) reveals that among the Norwegian respondents, half of men and slightly over half of the women believe that unrelated hospital staff can access their medical data, while 20 percent of men and slightly over 10 percent of women say that they don't know. (Table 9) displays an overwhelming support for medical data only being available for hospital staff assigned to them, with almost 80 percent of men and women in favor.

*Table 8: Do you think that your medical data is exclusively available to hospital staff assigned to you?*

		Do you think that your medical data is only available to hospital staff assigned to you?					
		Yes		No		Don't Know	
		Count	Percent	Count	Percent	Count	Percent
Gender	Men	15	30,0%	25	50,0%	9	18,0%
	Women	34	33,3%	53	52,0%	12	11,8%
	Other	2	66,7%	1	33,3%	0	0,0%

*Table 9: I want my medical data to be available exclusively to hospital staff assigned to me*

		I want my medical data to be available only to hospital staff assigned to me									
		Strongly Disagree		Strongly Agree		Neutral		Agree		Strongly Agree	
		Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Gender	Men	3	6,0%	2	4,0%	7	14,0%	16	32,0%	22	44,0%
	Women	3	2,9%	5	4,9%	13	12,7%	32	31,4%	49	48,0%
	Other	0	0,0%	0	0,0%	1	33,3%	0	0,0%	2	66,7%

The Funnel Chart (Figure 7) illustrates that 137/155 (88,4%) of respondents picked Social Security Number as one of their four answers even though it is not classified as “sensitive data” by Datatilsynet (Datatilsynet, 2019). Medical data ranks second among the most important types of data for the Norwegian public. The loss of said data or misuse by bad actors would worry Norwegians, as 53,5% of the respondents picked it among their four choices. There were also surprisingly 0/155 (0%) answers for both Nationality and gender data, suggesting that Norwegians are not afraid of others "misusing" their nationality or gender data.



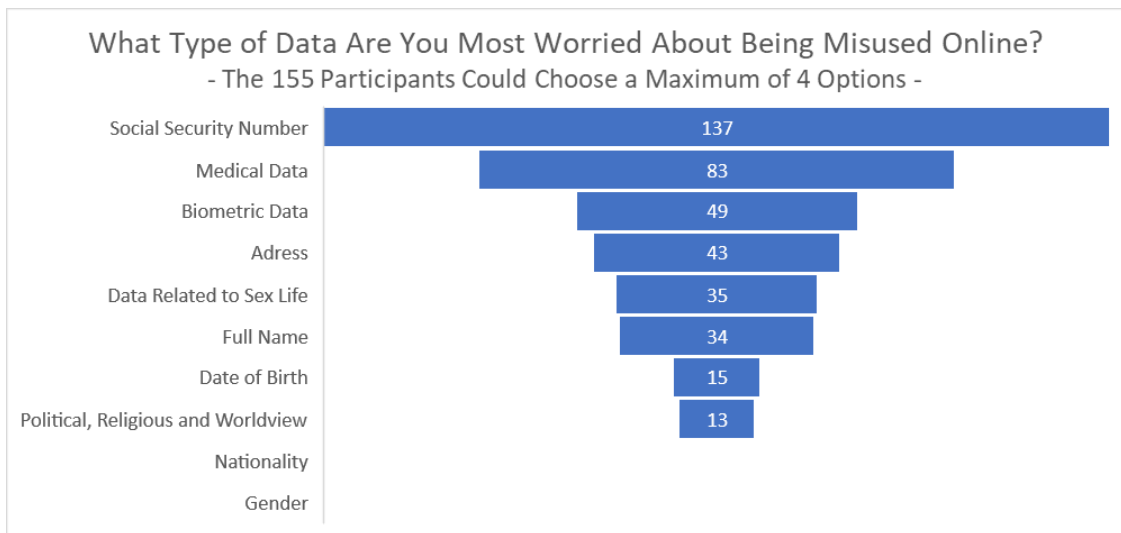


Figure 7: What Type of Data Are You Most Worried About Being Misused Online Chart

Table 10: What Type of Data Are You Most Worried About Being Misused Online Table

	Frequency	Percent
Social Security Number	137	88,4
Medical Data	83	53,5
Biometric Data	49	31,6
Adress	43	27,7
Data Related to Sex Life	35	22,6
Full Name	34	21,9
Date of Birth	15	9,7
Political, Religious and Worldview	13	8,4
Nationality	0	0,0
Gender	0	0,0
Total	155	100,0

(Figure 8) shows that the average level of worry is slightly under neutral with most of the age groups under 3,00. There were no males in the age group between 35 to 44 that answered our survey. We take the value from what the women and men have answered and divide it by how many statements there are in our survey, we then get the marginal mean. This shows that especially the respondents between the age 44 and 54 agree with our hypothesis regarding worry and GP's. It also shows that men over 65 answers contrary to our hypothesis.

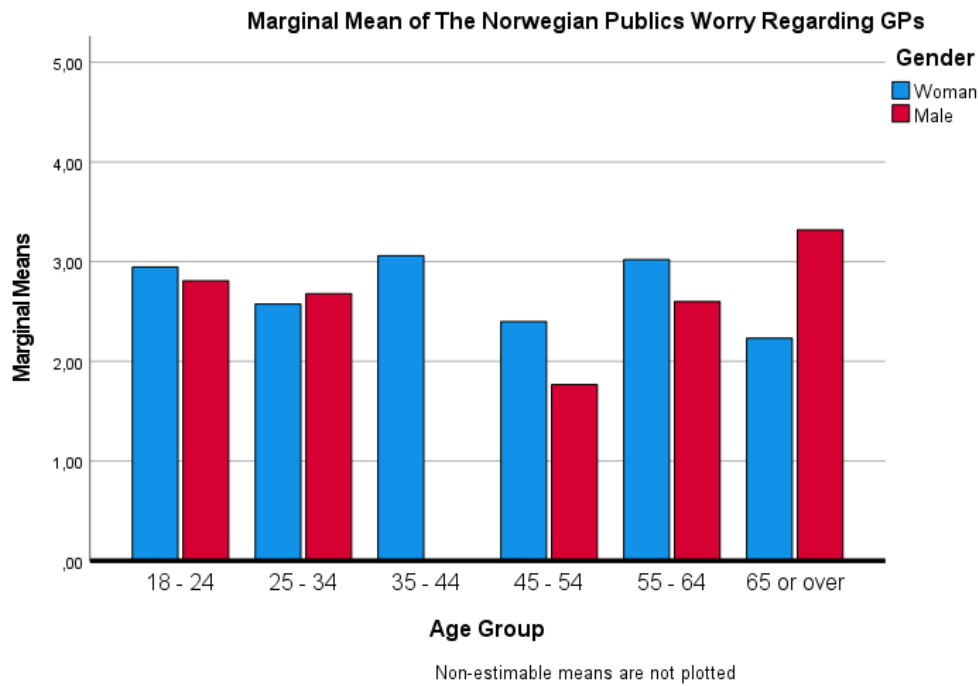


Figure 8: Marginal Mean of The Norwegian Publics Worry Regarding GPs

The ANOVA analysis (Table 11) uses the combined worry about GP variables which have been combined to the mean value. When we run the ANOVA test, we get the answer that says our Sig. is a 0.867 which is over 0,5/5%, meaning that the relationship between worry regarding GPs is not statistically significant. Since our F-value is ,143 in the ANOVA figure, there is less variance between sample averages compared to sample variation (Sørebo, 2021). Same as the other ANOVA test (Table 5) we did not run any post hoc test due to the results being not statistically significant. The post hoc tests are used in the same way that ANOVA is used, instead of multiple t-tests to control the experiment wise error rate.

Table 11: GP Worry Anova

ANOVA					
Combined Worry About GP					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,297	2	,149	,143	,867
Within Groups	158,045	152	1,040		
Total	158,342	154			

### 10.2.1 Summary of Hypothesis 2

We hypothesized that *"The Norwegian public are not Worried about the treatment of their medical data"*. Four of the five survey statement questions about GPs in (Figure 5) indicate that our hypothesis was correct, especially worry regarding the *"Handling of my medical data"*, which had 49,7% negative responses compared to the mean of 41,1%. However, *"Lack of Cybersecurity knowledge"* among GPs was the only scenario the Norwegian public was worried about where 42,6% were worried on various levels. There are also less unsure or indifferent responders compared to the satisfaction related to medical data treatment results. 32,6% is the mean of neutral responses compared to 47,9% for satisfaction regarding GP and 54,1% for satisfaction regarding hospitals. The results from the worry statements regarding hospitals paints a different picture (Table 7) with 51,2% of the responders answering that they are worried about the safety of their medical data at hospitals, compared to only 21,3% answering that they are not worried. As many as 53,7% are worried about who hospitals allow access to medical data of patients for, and 44,7% are worried that the cybersecurity at their hospital is too weak. The mean of overall worried responses are 45,4%, which is lowered by the statements regarding the handling of medical journals at hospitals category where only 31,8% are worried compared to 28,2% unworried responses. The Funnel Chart (Figure 7) suggests that medical data is one of the most important types of data Norwegians want safeguarded, but despite this, (Figure 5) shows that the respondents' opinion is that they are not worried about this data when GPs are handling it. The handling of said data by hospitals in contrast garners a worried response from the participants, suggesting that the results from the Funnel Chart (Figure 7) are aimed at the security of patients' medical data.

We can conclude that Norwegians on average are not worried about their GPs treatment of their medical data, although a Lack of Cybersecurity knowledge among GPs is an exception. The Norwegians public are however worried about their hospitals' treatment, especially the security of their medical data, but the handling of medical journals at hospitals is an exception since there is almost an equal amount of positive and negative responses.

### 10.3 Patient *Satisfaction* Has a Positive Impact on Patient *Trust*

The regression analysis in (Figure 9) tells us that  $R^2$  Linear has a 52,4% medium correlation. This means that the spread of answers has a medium-variability. We use the  $(y=a+bx)$  equation to measure how satisfaction with GP impacts trust in GP. Trust in GP (y) is 0,96 (a) when satisfaction with GP is 0. +0,81 (b) is how much trust in GP (y) is increased when 1 unit of satisfaction with GP (x) is added. This means that we can predict how much trust in GP (y) will increase when the Norwegian

public is satisfied with their GPs (x). The regression analysis shows that our hypothesis was correct regarding GPs, with satisfaction having a strong positive impact on trust in GPs.

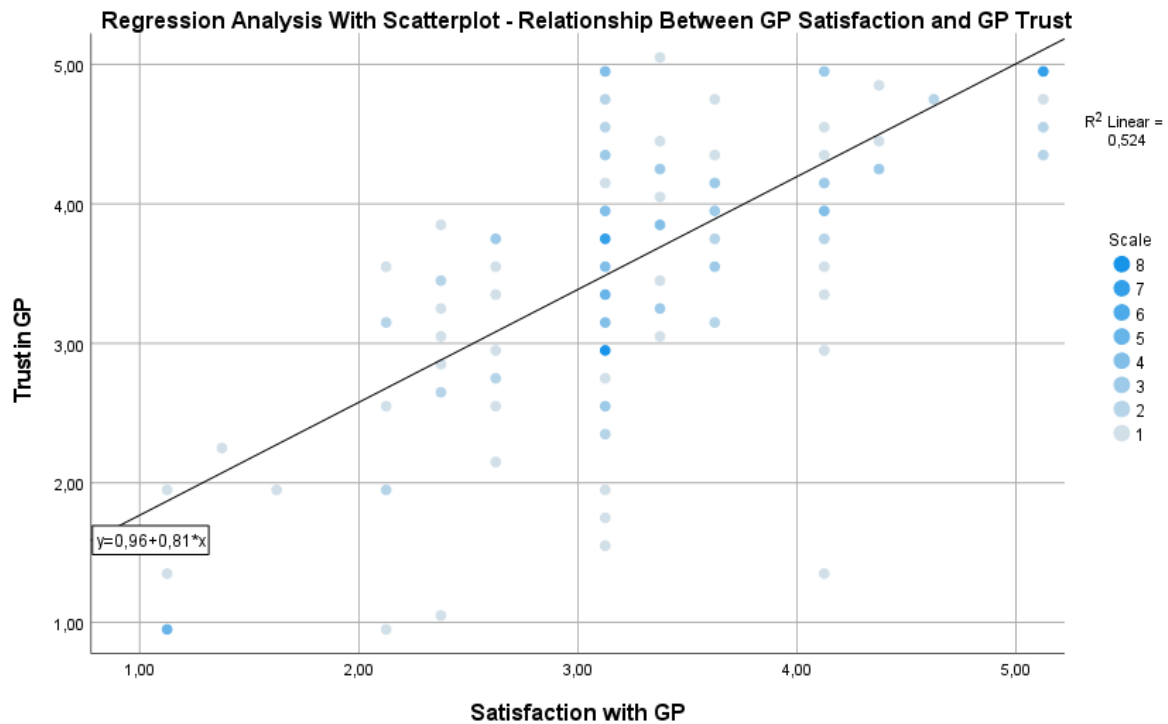


Figure 9: Regression Analysis with Scatterplot - Relationship Between GP Satisfaction and GP Trust

Correlation (0,724) is strong (Table 12) and there is a positive linear relationship between satisfaction with GP and trust in GP. The P-value is 0.001, meaning that the correlation is significant and that there is a low chance the results from the sample occurred by chance.

Table 12: Relationship Between GP Satisfaction and GP Trust Correlation

		Correlations	
		Trust in GP	Satisfaction with GP
Trust in GP	Pearson Correlation	1	,724**
	Sig. (2-tailed)		<,001
	N	155	155
Satisfaction with GP	Pearson Correlation	,724**	1
	Sig. (2-tailed)	<,001	
	N	155	155

\*\* . Correlation is significant at the 0.01 level (2-tailed).

R<sup>2</sup> Linear in (Figure 10) has a 61,5% medium correlation. This means that the spread of answers has a medium-variability. We use the (y=a+bx) equation to measure how satisfaction with hospitals impacts trust in hospitals. Trust in hospitals (y) is 0,34 (a) when satisfaction with hospitals is 0. +0,92

(b) is how much trust in hospitals (y) is increased when 1 unit of satisfaction with GP (x) is added. This means that we can predict how much trust in hospitals (y) will increase when the Norwegian public is satisfied with their hospitals (x). The regression analysis shows that our hypothesis was correct regarding hospitals, with Satisfaction having a strong positive impact on trust in hospitals.

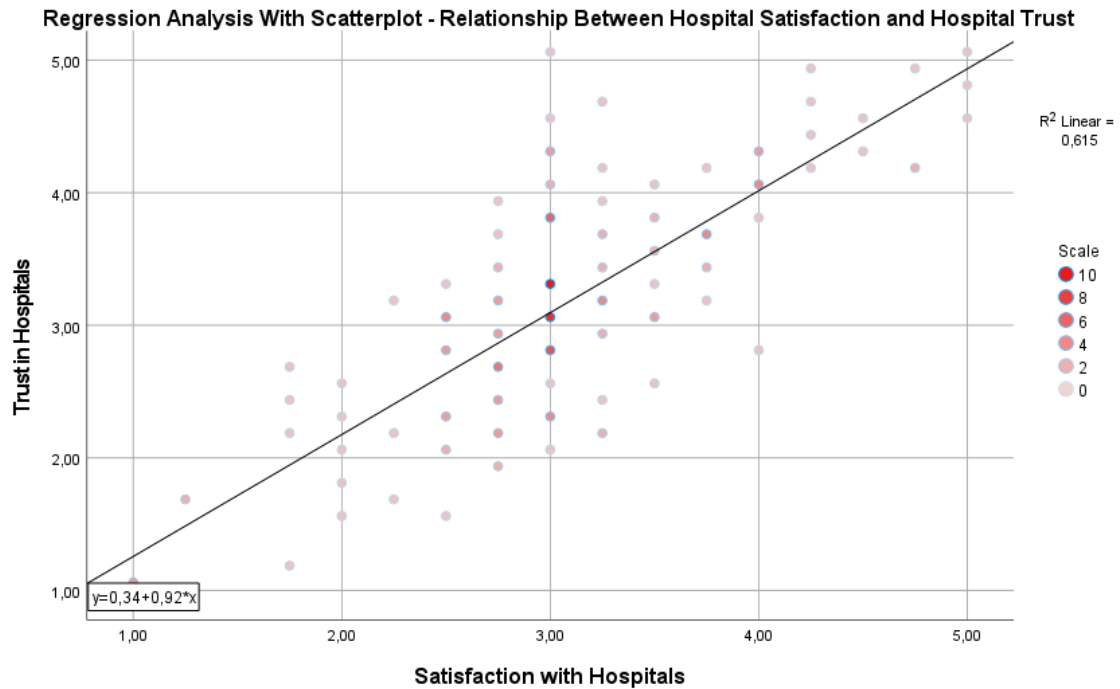


Figure 10: Regression Analysis with Scatterplot - Relationship Between Hospital Satisfaction and Hospital Trust

Correlation (0.785) is strong in (Table 13) and there is a positive linear relationship between satisfaction with hospitals and trust in hospitals. The P-value is 0.001, meaning that the correlation is significant and that there is a low chance the results from the sample occurred by chance.

Table 13: Relationship Between Hospital Satisfaction and Hospital Trust Correlation

		<b>Correlations</b>	
		Trust in Hospitals	Satisfaction with Hospitals
Trust in Hospitals	Pearson Correlation	1	,785**
	Sig. (2-tailed)		<,001
	N	155	155
Satisfaction with Hospitals	Pearson Correlation	,785**	1
	Sig. (2-tailed)	<,001	
	N	155	155

\*\* . Correlation is significant at the 0.01 level (2-tailed).

### 10.3.1 Summary of Hypothesis 3

The hypothesis was that "Patient satisfaction has a positive impact on Patient Trust". The results show that trust in GP increases by an average of 0,81 each time the patient's satisfaction with their GP rises by 1, which is a strong increase. Trust in hospitals increased strongly with 0,92 when satisfaction with the patient's hospital rose. We can conclude that Patient satisfaction has a strong and significant positive impact on patient trust, both for GPs and hospitals.

## 10.4 Patient Worry Has a Negative Impact on Patient Trust

The regression analysis in (Figure 11) shows an  $R^2$  Linear of 25,1% with weak correlation. This means that the spread of answers has a high-variability and is noisy. We use the  $(y=a+bx)$  equation to measure how worry about GP impacts trust in GP. Trust in GP (y) is 04,91 (a) when worry about GP is 0. -0,5 (b) is how much trust in GP (y) is decreased when a one-unit of worry about GP (x) is added. This means that we can predict how much trust in GP (y) will decrease when the Norwegian public is worried about their GPs (x). The regression analysis shows that our hypothesis was somewhat correct regarding GPs, with worry having a moderate negative impact on trust in GPs.

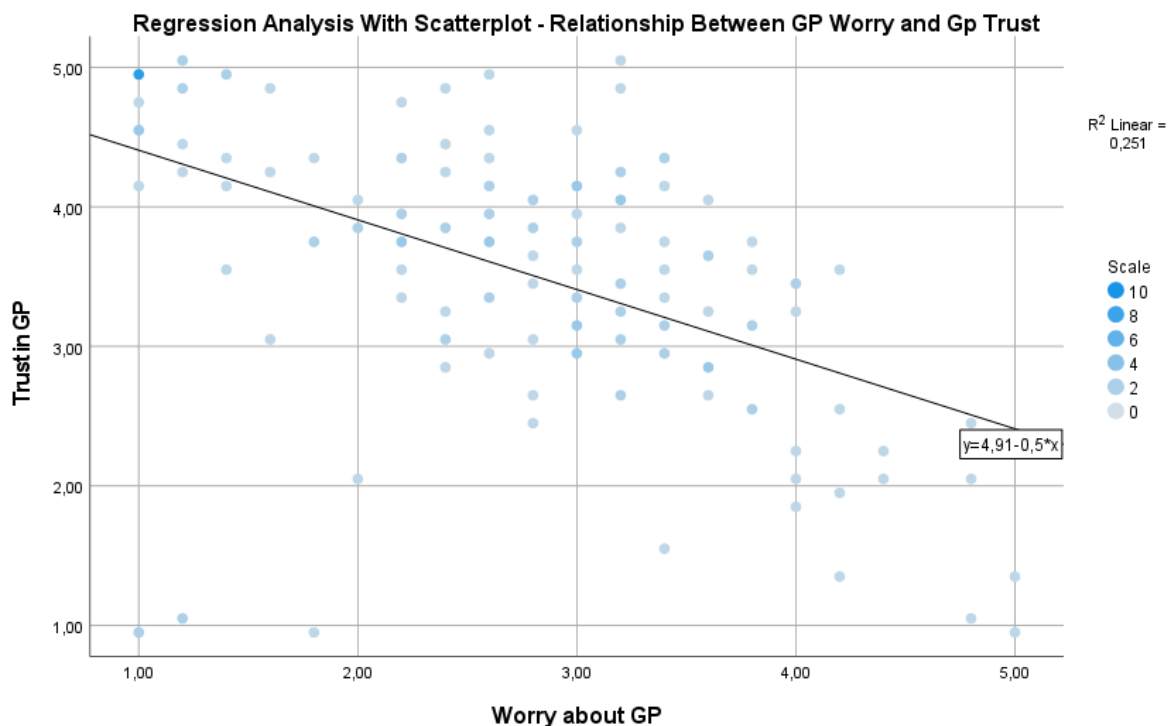


Figure 11: Regression Analysis with Scatterplot - Relationship Between GP Worry and GP Trust

Correlation (-0,501) is moderate as shown in (Table 14) and there is a negative linear relationship between worry about GP and trust in GP. The P-value is 0.001, meaning that the correlation is significant and that there is a low chance the results from the sample occurred by chance.

Table 14: Relationship Between GP Worry and GP Trust Correlation

		Worry about GP	Trust in GP
Worry about GP	Pearson Correlation	1	-,501**
	Sig. (2-tailed)		<,001
	N	155	155
Trust in GP	Pearson Correlation	-,501**	1
	Sig. (2-tailed)	<,001	
	N	155	155

\*\* . Correlation is significant at the 0.01 level (2-tailed).

R<sup>2</sup> Linear in (Figure 12) has a 50,5 % medium correlation. This means that the spread of answers has a medium-variability. We use the (y=a+bx) equation to measure how worry about hospitals impacts trust in hospitals. Trust in hospitals (y) is 5,29 (a) when worry about hospitals is 0. -0,66 (b) is how much trust in hospitals (y) is decreased when 1 unit of worry about hospitals (x) is added. This means that we can predict how much trust in GP (y) will decrease when the Norwegian public is worried about their hospitals (x). The regression analysis shows that our hypothesis was correct regarding hospitals, with worry having a strong negative impact on trust in hospitals.

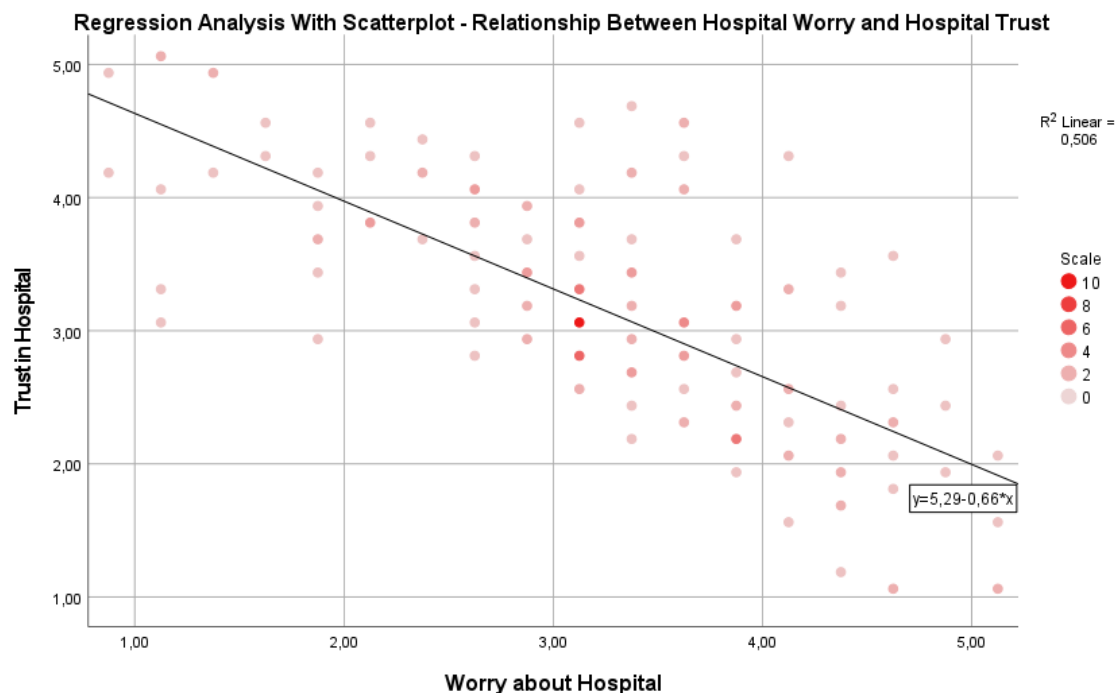


Figure 12: Regression Analysis with Scatterplot - Relationship Between Hospital Worry and Hospital Trust

Correlation (-0,711) in (Table 15) is strong and there is a negative linear relationship between worry about hospitals and trust in hospitals. P-value is 0.001, meaning that the correlation is significant and that there is a low chance the results from the sample occurred by chance.

*Table 15: Relationship Between Hospital Worry and Hospital Trust Correlation*

		Trust in Hospital	Worry about Hospital
Worry about Hospital	Pearson Correlation	-,711**	1
	Sig. (2-tailed)	<,001	
	N	155	155
Trust in Hospital	Pearson Correlation	1	-,711**
	Sig. (2-tailed)		<,001
	N	155	155

\*\* . Correlation is significant at the 0.01 level (2-tailed).

#### 10.4.1 Summary of Hypothesis 4

The hypothesis was that *"Patient worry has a negative impact on Patient Trust"*. The results show that trust in hospitals decreases by an average of 0,5 each time the patients worry with their GP rises by 1, which is a moderate decrease. Trust in hospitals decreased strongly with 0,92 when worry about the patient's hospital shrank. We can conclude that Patient Worry has a moderate and significant negative impact on patients trust in GPs, while it has a strong and significant negative impact on patients trust in hospitals.

### 10.5 Trust the Norwegian Public Has in the Handling of Their Medical Data

(Figure 13) shows that there is a high level of trust in GPs. The Norwegian public is highly trusting regarding "Guidelines on cybersecurity being followed" by their GP. "Knowledge in data security" almost has half of their responses picking one of the positive options, despite having the lowest percentage of trust among the statement questions.



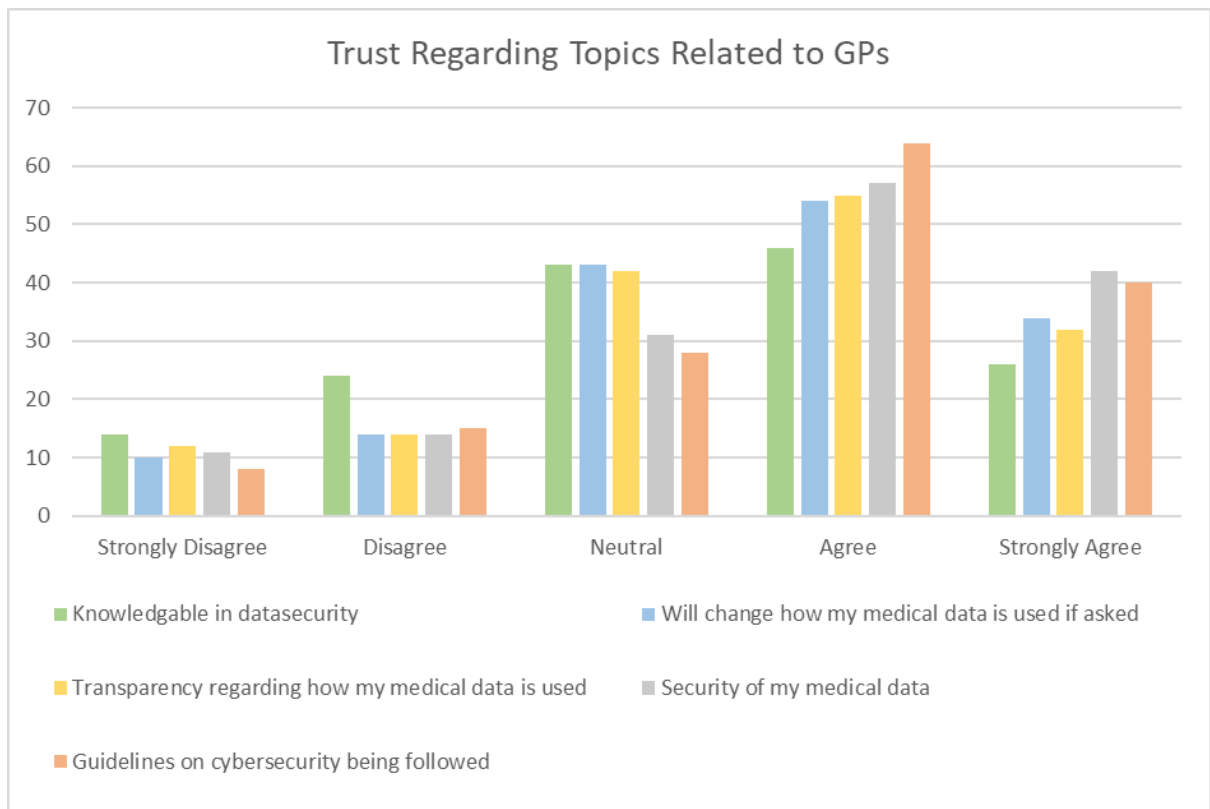


Figure 13: Trust Regarding Topics Related to GPs Chart

Table 16: Trust Regarding Topics Related to GPs Table

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Knowledgeable in datasecurity	14	9,2%	24	15,7%	43	28,1%	46	30,1%	26	17,0%	153	100,0%
Will change how my medical data is used if asked	10	6,5%	14	9,0%	43	27,7%	54	34,8%	34	21,9%	155	100,0%
Transparency regarding how my medical data is used	12	7,7%	14	9,0%	42	27,1%	55	35,5%	32	20,6%	155	100,0%
Security of my medical data	11	7,1%	14	9,0%	31	20,0%	57	36,8%	42	27,1%	155	100,0%
Guidelines on cybersecurity being followed	8	5,2%	15	9,7%	28	18,1%	64	41,3%	40	25,8%	155	100,0%
Mean	11	7,1%	16	10,5%	37	24,2%	55	35,7%	35	22,5%	155	100,0%

(Figure 14) shows that there is a medium level of trust in hospitals, although many trust that hospitals store their medical journals safely. Statements regarding the handling of their medical journals is an outlier, with over 40 percent answering positively. Statements regarding strong cybersecurity have the most neutral responses, with around 35 percent unsure whether they trust it or not.

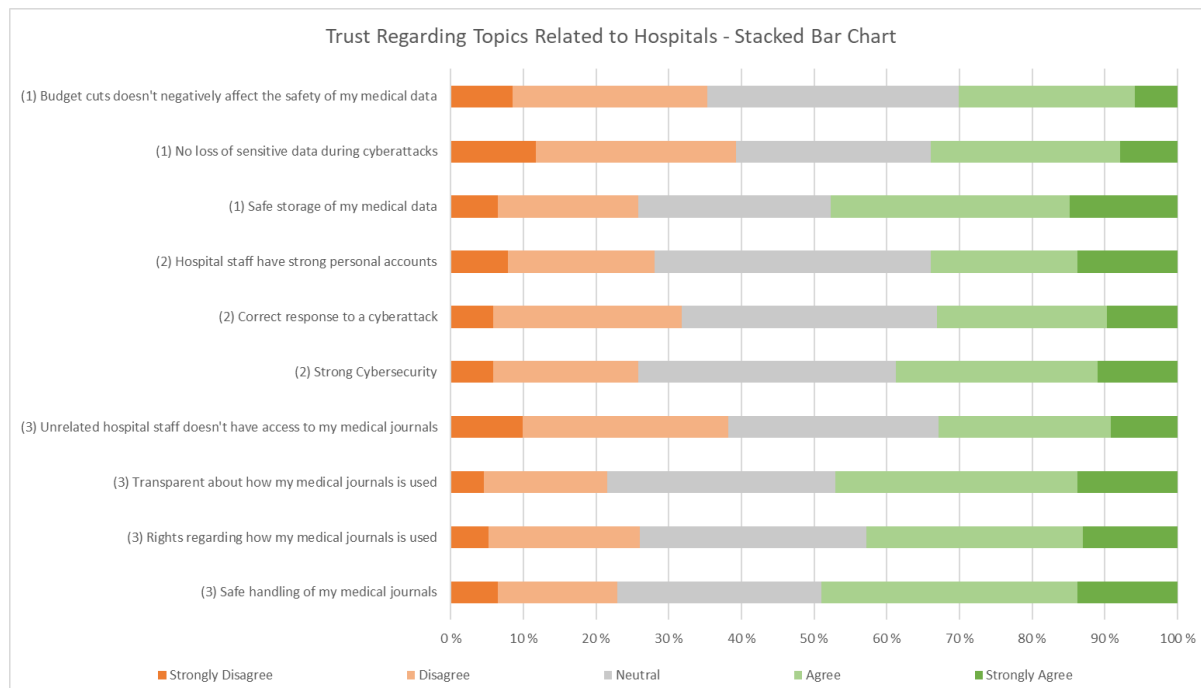


Figure 14: Trust Regarding Topics Related to Hospitals - Stacked Bar Chart

Table 17: Mean of Trust Statements Regarding Topics Related to Hospitals

	Mean of Trust Statements Regarding Topics Related to Hospitals											
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	Mean	Percent	Mean	Percent	Mean	Percent	Mean	Percent	Mean	Percent	Mean	Percent
Statements regarding the safety of my medical data	14	8,9%	38	24,5%	45	29,3%	43	27,7%	15	9,5%	154	100,0%
Statements regarding strong cybersecurity	10	6,5%	34	22,1%	56	36,2%	37	23,8%	18	11,5%	154	100,0%
Statements regarding the handling of my medical journals	10	6,5%	32	20,6%	46	29,9%	47	30,5%	19	12,4%	153	100,0%
Mean	11	7,3%	34	22,4%	49	31,8%	42	27,4%	17	11,1%	154	100,0%

## 10.6 Summary of Results

To summarize, the Norwegian public neither trust nor lack trust in hospitals properly handling their medical data. Trust in hospitals not allowing unrelated hospital staff access to their medical data is especially low. On the other hand, trust in GPs is quite high. There are exceptions, like how trust in the knowledge GPs have in data security, which is noticeably lower compared to the other topics.

Satisfaction with medical data handling has a strong and positive impact on how much the Norwegian Public trust their GP and hospitals. Worrying about the quality of medical data handling has a strong negative impact on trust in hospitals, while it has a moderate negative impact on a patients trust in their GP. The respondents to the survey also indicated that they are slightly satisfied with their GPs treatment of their medical data, while they were neutral in regard to hospitals. Norwegians are also not worried about how GPs treat their medical data. However, they are worried about hospitals, especially the security of their medical data.

## 11 Discussion

The discussion section interprets the results and suggests meanings behind the survey answers. The research question is answered, and our hypotheses are questioned. We provide recommendations based on our interpretations and discuss the limitations of the study.

### 11.1 Back to Research Question

Returning to our research question, how much does the Norwegian public trust in the handling and security of their medical data? There is overall high trust in GPs, while there is a moderate level of trust in hospitals. The trust in GPs could come from the more personal relationship a patient has with their GP compared to their hospital of choice. There is also more media coverage of issues at hospitals compared to GPs, which might color the opinion of the Norwegian public in a more negative way towards hospitals, justifiably or not.

We hypothesize that the Norwegian public is satisfied with their GPs and hospitals' treatment of their medical data. The results we gathered shows that almost half of the respondents answered neutral when asked if they are satisfied with various statements regarding their GP and have the same answer regarding hospitals. The sheer number of neutral answers suggests that the Norwegian public either don't feel strongly for or against how their medical data is handled or that they can't form an opinion on the topic since they are not aware how their medical data is handled to begin with. It could also mean that they have never thought about how their medical data is used in the first place or that they are unsure what to answer.

There is no answer whether or not the Norwegian public are satisfied with their GPs level of transparency regarding how their medical data is used. The implication is that they don't have a strong opinion regarding their satisfaction on this topic. Although there is a noticeable larger amount of dissatisfied respondents regarding this statement question compared to the other two. There

respondents could feel that they have not received enough information from their GP about how their data is used by them. The small amount of negative answers regarding rights over how their medical data is used could mean that very few respondents have had a negative experience when requesting to have a portion of their medical data edited or deleted.

The Norwegian public is less satisfied with their hospital compared to their GP. The statement questions all have an even amount of positive and negative responses, suggesting that they are neither satisfied nor dissatisfied with their hospitals' treatment of their medical data. The amount of neutral answers is even higher compared to the GP satisfaction questions. The implication is that the respondent does not have a strong opinion regarding hospitals, while they are more aware of their satisfaction regarding their GPs handling and security of their medical data.

The (Figure 4) implies that age group and gender does not significantly affect satisfaction with GPs. This could mean that satisfaction regarding this topic does not change regardless of which subset of the Norwegian public is asked.

In our second hypothesis, we hypothesize that the Norwegian public are not worried about the treatment of their medical data. The data that we collected shows in (Figure 5) that half of the respondents to the question regarding worry about the "*Handling of my medical data*" by GPs chose a negative response, this implies that they are not worried that their GP will misuse or lose medical information about them. They are instead worried about medical data handling at hospitals as shown in (Figure 6). This could imply that patients are aware that GPs' patient records are stored locally, while the more important summary care record is more easily available at hospitals for attackers, increasing worry regarding hospitals. It also implies a high level of trust in GPs as responders don't worry despite medical data being second on the Funnel Chart (Figure 7) of data types Norwegians are worried about. A cyberattack targeting a hospital would do more harm than one targeting a local GP, which would make the results understandable. The respondents were worried about a lack of cybersecurity training for GPs. This could mean that the respondents are afraid GPs don't focus enough on keeping themselves up to date with the latest cybersecurity threats, since new threats appear all the time (Rosencrance, 2021).

Most of the respondents say that they are not worried about the safety of their medical data in the hands of their GP. This indicates that the Norwegian public are not worried, despite listing medical data as their second most worried about data type being misused in Funnel Chart (Figure 7). The implications are that even the most worried about data type is overall not a big concern for the Norwegian public.

The worry statements regarding hospitals shows that over half of the respondents are worried about the safety of medical data at hospitals. It implies that the respondents may have heard or read about cybersecurity incidents at hospitals from the news and are therefore worried about their own medical data. Over half of the respondents are worried about who can access their medical data at hospitals. Most of the respondents in (Table 8) believe that unrelated hospital staff can access patients' medical data regardless of their responsibility over them or not. (Figure 9) shows an overwhelming support for medical data only being available to related hospital staff assigned to them. The implications are that the worry stems from a wish for limited access to their medical data, while at the same time believing the opposite is true. A wrong response to a cyberattack from hospitals is one of the biggest worries for the Norwegian public. They might be worried about this because they don't believe hospitals will properly respond to a ransomware-attack, which is the biggest threat to hospitals (Rosencrance, 2021).

(Figure 7) illustrates that the Norwegian public picked "*social security number*" as their most worried about data type even though it is not classified as "*sensitive data*" by Datatilsynet (Datatilsynet, 2019), which implies that Norwegian has poor knowledge on data security or have not been updated. There was surprisingly no one answering nationality or gender as one of their four choices in the Funnel Chart (Figure 7), which would imply that Norwegians are not worried about others "*misusing*" their nationality or gender data online. In other countries, revealing their gender online and which nation they are from could negatively impact them based on national laws. Revealing their nationality while being outspoken about their government could have them tracked and possibly arrested in their country (Linda Guerry, 2020). This implies that the Norwegian public trusts their government when it comes to laws concerning their freedom of speech, meaning that Norwegian feel they can express their opinions online without getting any consequences from it based on their gender.

We were right about our third hypothesis, since the regression analysis (Figure 9) displays that GP satisfaction has a positive impact on GP trust. (Figure 10) shows the same for hospitals. This indicates that a non-satisfactory experience with a GP or a hospital would lower their trust in those institutions altogether. Likewise, a good experience resulting from high quality of service would also increase trust. This is because prior positive experience will increase the perceived likelihood of receiving a similar quality of service in the future, increasing the trust in its quality in the process.

The regression analysis in (Figure 11) and (Figure 12) shows that worry has a negative impact on trust, just like we had hypothesized. Meaning that the worry the Norwegian public had during the incidents where Norsk helsenett mistakenly allowed patients to gain access to other patient's medical

data also resulted in lowered trust in the security of their medical data altogether (Knudsen, 2016). If a patient is worried about the quality of a particular service at hospitals or from their GP, trust in their ability to deliver said service would also decrease.

## 11.2 Recommendations

GPs ought to convert as many of the neutral respondents to trusting patients by being more transparent about how they handle and use medical data, as well as what kind of rights they have over their own medical data. Satisfaction towards the level of transparency on how their medical data is used by their GP is noticeably lower than the other statements, which suggests that GPs should be clearer about how they will be using the medical data of their patients. There is also a large number of respondents that believe unrelated hospital staff can access someone's patient data while almost everyone wants the data to be exclusively available to hospital staff assigned to them. Hospitals should make it clear for their patients that their medical data can't be viewed by medical practitioners and staff who have nothing to do with it. Medical practitioners should also be reminded of the Cybersecurity guidelines provided by HelseCERT more often, as well as receive more training related to said guidelines. The Norwegian Health Network needs to give out more information on how medical data is being stored and treated.

## 11.3 Limitations

The *“What do you think is the biggest online security threat GPs need to be aware of when dealing with medical data?”* question in the survey does not tell participants to specify if a blank answer means that they do not know the answer. Therefore, we do not know if the blank answers mean that the respondents are unaware or if they just didn't bother answering. This also applies to the *“What do you think is the biggest online security threat hospitals need to be aware of when dealing with medical data?”* However, the sheer number of blank answers or *“Don't know”* answers could be interpreted as a lack of knowledge regarding these security threats, which could explain why there are so many neutral answers in the satisfaction and worry statements questions for both GPs and hospitals. We found a flaw in our survey that could leave a hole in the data. We had written (33-44) and (44-54) as options in our selection for age groups, which could have meant that some of the 44 year old respondents took the (44-54) alternative instead of (33-44). People aged 44 years old would have been confused as to which of the two options they belong too. Another limitation is that there were no men that answered in the age range from 33-44. This demonstrates how we suffered from a lack of sample size from our survey, since it negatively impacted how useful our age group question could be for our analysis.

## 12 Conclusion

In this section, we will discuss the study's contributions, summarize the study, practical implications, research implications and recommendations for further research.

This study has concentrated on how much the Norwegian public trust that general practitioners and medical practitioners at hospitals will properly handle their medical data, as well as how they protect it against attackers. It provides a new look on how the treatment of medical data affects satisfaction, worry and trust towards different health institutions. It is unique in the fact that it looks at these topics in a Norwegian context, providing new insight, findings and interpretations. The Norwegian public's opinion on various aspects of data handling and data security are analyzed, which can be used to determine what kind of improvements both general practitioners and hospitals should focus on in the future.

This quantitative study first presents our related literature regarding eHealth, medical data, medical records, data handling, and data security. Then the hypothesis section is presented. Next, the research methodology including the research approach, data collection, data analysis, validity of the survey, and limitations of the research approach.

The results from our survey indicate that the Norwegian public is slightly satisfied with their GPs handling and security of their medical data, while satisfaction with hospitals was neither positive nor negative. The Norwegian public are not worried about their GPs treatment of their medical data. However, worry regarding hospitals is noticeable. It is proven that satisfaction with medical data treatment has a positive effect on trust, while worry negatively impacts trust. In the discussion section, the results are interpreted, and possible reasons for the levels of satisfaction, worry, and trust are discussed. Recommendations for general practitioners and hospitals are suggested based on our interpretations of the results, while the limitations of our study are presented afterwards. The study comes with some possible implications for practice and research, and potential future research.

### 12.1 Implications for Practice

Our research study shows that most of the respondents are not sure how Norwegian GPs and hospitals handle their medical data. Our findings show that the general public don't know enough or are unaware about the data security and handling that the GP's and hospitals do. With this research study we want to give suggestions on how the Norwegian public trusts the medical network. We hope that other research communities continue to research to see if they can find more information on how much the Norwegian public trusts the safety and handling of medical data.

## 12.2 Implications for Research

This study provides information and problems to the health sector and research communities. This study may make other scientific groups investigate what the Norwegian public thinks about the security of medical data in Norway or other nations and get more detailed information.

Our findings indicate that the general public does not understand or are ignorant of the data security and management practices used by GPs and hospitals. This study reveals that the Norwegian public is still unaware about how GPs and hospitals protect themselves from cyberattacks. Other researchers should study the reasons behind the lack of awareness, as well as possible ways for GPs and hospitals to fix these issues.

## 12.3 Future Research

The Norwegian participants in our survey do not worry about others knowing their nationality or potentially misusing this piece of data. This could be an interesting point of investigation in future research and could be compared with respondents from other countries. Most of the respondents picked social security number as their most worried about data type even though it is not classified as “*sensitive data*” by Datatilsynet (Datatilsynet, 2019). Other researchers could study the reasons for its frequency in the Funnel Chart (Figure 7). Further research could involve participants from other countries like Denmark, Sweden, and Finland, in order to find out if there are big differences between the Nordic countries. The reasoning behind the lack of knowledge regarding how medical data is used could be a point of future research, as well as possible ways to increase patient trust in Norwegian hospitals.



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