



# LUND UNIVERSITY

## Societal services and traumatic spinal cord injury: A multifaced interaction

Nordgren, Camilla

2006

[Link to publication](#)

*Citation for published version (APA):*

Nordgren, C. (2006). *Societal services and traumatic spinal cord injury: A multifaced interaction*. [Licentiate Thesis, Certec - Rehabilitation Engineering and Design].

*Total number of authors:*

1

### General rights

Unless other specific re-use rights are stated the following general rights apply:

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: <https://creativecommons.org/licenses/>

### Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117  
221 00 Lund  
+46 46-222 00 00

# Societal Services and Traumatic Spinal Cord Injury: A Multifaceted Interaction

Camilla Nordgren

Licentiate Thesis, Certec 1:2006

---



Division of Rehabilitation Engineering Research  
Department of Design Sciences  
Faculty of Engineering  
Lund University



# Societal Services and Traumatic Spinal Cord Injury: A Multifaceted Interaction

Camilla Nordgren

**Licentiate Thesis**

Certec  
Division of Rehabilitation Engineering Research  
Department of Design Sciences  
Faculty of Engineering  
Lund University



## Preface

For many years I worked as an economist at Spinalis, the Spinal Cord Injury Centre at Karolinska University Hospital in Stockholm, Sweden. It provides specialized outpatient services for adults with such injuries due to accident or disease. Working in that organization with the rehabilitation staff and patients all around me, I often was a passive listener to ongoing conversations. I caught snatches of discussions between patients that dealt with the kinds of support, service, and rehabilitation they had applied for, what they had and hadn't been granted. Topics, such as the level of disability benefits and leather upholstery as a car adaptation, sailed by. I contemplated the fact that patients who were waiting to have their pressure sores redressed, for example, weren't primarily talking about their medical conditions but were instead discussing other services that other public actors dealt with somewhere else, in another setting.

Staff members were also engaged in something other than rehabilitation. It wasn't unusual that one of them would be looking for a patient who hadn't shown up for an appointment – afterwards I often heard that there had been delays or difficulties with the transportation service. I remembered my own summers growing up, a portion of which were spent in the hospital for check-ups after incurring a traumatic spinal cord injury. It wasn't a matter of a noticeable deterioration in my condition; the check-ups were carried out as a preventive measure. I realized that the current time spent in initial inpatient care meant that the treatment time soon would be on the same scale as my previous preventive check-ups.

This flora of conversations reflected my own experiences of how health care, rehabilitation, support and services have worked for all the years I have lived with a spinal cord injury. I concluded that my own experiences weren't just mine, but clearly many others as well. Thoughts on how society is organized to support all individuals who have incurred a traumatic spinal cord injury took shape. A number of questions emerged: What supports are actually formalized? How do you apply for

them? On what grounds are decisions made as to who can receive support and at what level? How has the length of treatment appeared over time? How decisive are personal characteristics such as the level and extent of injury in relation to the services that these individual utilize? All of these questions later became the driving force and guiding light in my research to come up with a clear picture of existing societal services and how they are utilized after a traumatic spinal cord injury.

As a doctoral student, I have had the opportunity to examine this topic in depth. The licentiate thesis presented here is based on the research reported in three papers. Additional studies will be carried out and the results will form the foundation of a doctoral dissertation.

My research path has been long and winding. It started at Spinalis where I was recruited through the efforts of Dr. Claus Hultling, M.D. My encounters with Professor Åke Seiger have involved an introduction to as well as inclusion and guidance in the scientific sphere. Associate Professor Richard Levi and Dr. Gunnar Ljunggren, M.D. have also advised me. Without their commitment and supervision I would not have been able to realize my ideas. Thank you! From Karolinska, the road led me on to Lund University, Certec and Professor Bodil Jönsson – from medicine to technology. My background in business administration means that I am unusual and at times an oddball in this world, and yet I find myself right at home with its action orientation. Bodil's interest in my life experiences and ability to transform them into scientific scholarship has taught me much. I am grateful for that.

# Contents

Preface .....	1
Contents.....	3
Summary .....	4
Aim .....	5
Introduction .....	6
Significance of diagnosis-related societal economic studies .....	9
Cost of illness .....	9
Basic data .....	10
Research and publication.....	11
Material and Method.....	13
Ethical permission .....	14
Results .....	15
Applying for and receiving societal services .....	15
Methodological aspects of surveying societal services.....	16
Documentation of societal services .....	17
Discussion .....	18
Conclusion .....	22
Continued Research .....	23
References.....	24

# Articles

- I            Societal Services after Traumatic Spinal Cord Injury in Sweden
- II           Ethics in the Making
- III          On the Need of Validating Inpatient Databases

## Summary

The licentiate thesis is based on three papers. The aim of the research is to elucidate and analyze how societal services in practice are made available (or not available) and are utilized (or not utilized) by a group of individuals with traumatic spinal cord injuries (SCI).

The first article is an inventory of Swedish societal support and services that one can apply for after a traumatic SCI. Twenty-five such forms are identified, which are primarily administered by two authorities: the local (municipal) authority and the social insurance office. The consumers expressed their frustration with this organization and the feelings of being checked up on and called into question.

The second article analyzes how general ethical guidelines are challenged by situated ethics in the design context. This corresponds here to how the intentions that motivate the allocation of societal services are challenged by the experiences of the people directly affected when it comes to treatment, degree of complexity, and the transparency and predictability of the systems.

The third article deals with inpatient care utilization by an SCI group in Sweden and the usefulness of this data in surveying the group's total utilization. In an effort to validate the contents of this database, it became apparent that it was impossible to establish the group's total inpatient care utilization.

The articles also discuss methodological aspects of the surveying and documentation of societal services.



## Aim

The overall aim of the research presented is to *elucidate* and *analyze* the complexity in the distribution of societal services in Sweden. The organization is studied based on the existing societal actors and how they are internally organized, and on what this results in for utilization and non-utilization in the case of traumatic spinal cord injuries from a life-long perspective. The complexity affects:

- The individual and her ability to apply for and receive societal services. The analysis includes ethical perspectives and how the prevailing view society has of disabilities influences the supply of resources and their allocation.
- Methodological aspects of surveying societal services.
- How the utilization of societal services is documented or not documented and how this affects the basis for future resource planning.

## Introduction

The prevalence (total number) of people with traumatic spinal cord injuries (SCI) in the Stockholm region amounted to 233/1,000,000 at the beginning of the 1990s [1]. Dahlberg et al. reported a prevalence of 280/1,000,000 for the Helsinki region [2], while the incidence (number of new injuries per year) in the Netherlands at the same time was calculated to be 10.4/1,000,000 [3]. A traumatic SCI often entails a considerable loss of motor activity and sensory input and many become dependent on wheelchairs [4]. The survival frequency for people who incur a traumatic SCI has increased dramatically since the Second World War. The average life expectancy is approaching that of the normal population and people with these injuries can be found in all age groups.

Living with an extensive disability involves considerable effort and requires changes and adaptations in the lived environment. The ability to act is limited, margins are reduced and the consequences of unforeseeable events are greater. In the course of his or her lifetime, the effected person will become a large consumer of health care, support and social services that aim to enable integration into society, establish independence, compensate for impairments and facilitate daily life. The complexity of the injury and its effects on physical functions mean that the needs are great. Health care utilization in the form of in- and outpatient treatment comprises a large share of the cost, but other service needs can also be extensive because of their repetitive nature from the perspective of an entire life.

Today, an injured person's service consumption is borne by different authorities: the county, the municipality, the state in the form of the national social insurance scheme, private insurance companies and foundations. Support and services are distributed after a person has applied for them. No services are automatically supplied after an SCI and each can be granted after being subjected to a needs test based on a written application with certificates from doctors, social workers, occupational therapists and/or physical therapists. In the literature and public

debate, consumers often express their frustration at being dependent on the authorities [5]. Among other reasons, this frustration is due to poor treatment, feeling that one's needs are called into question, delays and insufficient resources from the authorities.

For a person with an extensive and life-long injury, contacts with different authorities/agencies will continue for the rest of his or her life. Figure 1 illustrates the network of contacts that will be established entirely or in part. The structure can vary from regions to region in Sweden, but each unit is typically organized as teams for particular types of errands that different administrators deal with. For an individual, this means that many different administrators are and will be involved in all the different application processes.

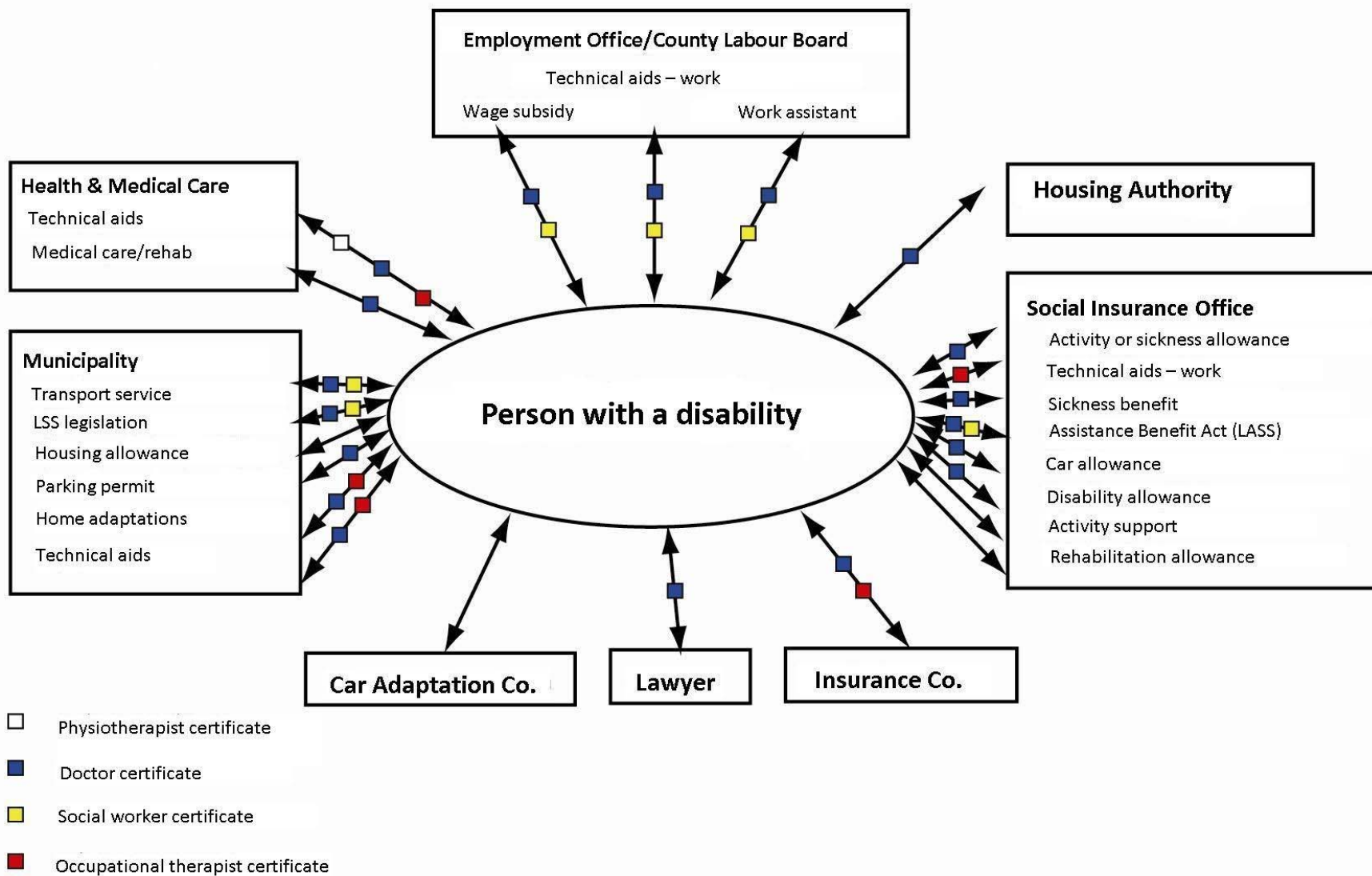


Fig 1. Möjligt samhällskontakt nät för personer med komplexa behov

## *Significance of diagnosis-related societal economic studies*

Knowledge of the resource utilization and costs that result from illness or injury is important as a basis for planning and prioritizing research, prevention, health care and rehabilitation [8]. However, information is many times lacking about both the direct and indirect costs. The economic consequences of chronic conditions are difficult to study since the services are utilized over a long period, involving a number of different actors who neither economically nor operationally come from organizations that share a common vision or are any way coordinated.

Consequently, remarkably little is also known of the total effects of all the collective supports together [9].

A basic assumption of economic science is that resources are finite and thus limited whereas needs appear to be constantly on the rise. This imbalance means that the resources have to be distributed as equitably and efficiently as possible. Health economics is concerned with finding the optimal solution for the utilization of resources in health care [10]. The economic challenge lies in choosing among possible alternatives so as to get as much health care and welfare as possible out of the resource utilization. Studies of the economic consequences following illness and/or injury have, in recent times, been met with great interest and are now seen as a natural component of official policy documents. They are included in the medical, scientific and popular scientific literature as well.

## *Cost of illness*

There are a variety of methods used to describe the economic consequences of illnesses and different interventions. Studies that describe the economic burden of an illness or injury for society use the cost-of-illness method (COI) [12]. A number of methodological considerations are associated with this approach. COI can be based on incidence or prevalence of an illness or injury [13]. In studies based on prevalence, all costs are calculated for a geographically defined population during a limited period, usually one year. In incidence-based studies, however, the lifetime

costs for the individual are calculated from the illness's onset until the time the person is cured or dies. These studies are difficult to carry out since chronic conditions can extend over decades, and so such studies are often limited to a given number of years [11,12].

Costs are identified on three levels:

- Direct costs, such as medical care and prescription costs
- Indirect costs, such as loss of production as a result of sick leave, disability pensions and premature death
- Abstract costs, such as psychosocial costs.

It is desirable that all cost be included, regardless of the authority or organization that bears them [11]. The data required for carrying out cost calculations is gathered from records or databases (top-down) or from surveys, patient records or longitudinal studies of a selection of subjects (bottom-up).

Cost calculations are carried out in three stages:

1. Identification of the services utilized
2. Quantification of the services utilized
3. Price setting of services

### ***Basic data***

An initial difficulty in calculating the total cost burden of an illness or injury is in identifying the individuals with the diagnosis in question. This often takes place by making a selection based on the diagnosis code. You then need to take a position as to whether the group selected is a true diagnosis group, i.e. validate how the diagnosis is determined as well as if the group is total or representative. In the case in point, this difficulty does not arise. Spinalis, which is now a regular outpatient

unit with total responsibility for all traumatic spinal cord injuries in Stockholm County, carried out an inventory of persons with traumatic spinal cord injury in its catchment area in the early 1990s. 379 individuals were identified [14]. Since then, each new case has been entered in the Spinalis patient database, made possible by an established and coherent chain of care. The total population of the database is unique in its kind. Other countries often only have access to patient information from a certain hospital or insurance system.

### *Research and publication*

The licentiate thesis presented here is based on three scientific articles:

#### I. Societal Services after Traumatic Spinal Cord Injury in Sweden.

Camilla Nordgren, Richard Levi, Gunnar Ljunggren, Åke Seiger

Journal of Rehabilitation Medicine 2003; 35:121-126

Thirty-four persons with traumatic SCI were interviewed and the results were used to identify the 25 separate services (besides health care) that were available in 1998 directly after the injury had occurred. The degree of satisfaction with the application procedure and the resource allocation were also assessed.

Each individual had applied on average for 5 services (range 0-11) in the course of one year. For 13 of the available services, at least 1 subject claimed ignorance of its existence. There was considerable frustration over the system and many individual disappointments, among them insufficient information and inadequate coordination.

#### II. Ethics in the Making.

Bodil Jönsson, Peter Anderberg, Eva Flodin, Lone Malmborg, Camilla Nordgren, Arne Svensk

Design Philosophy Papers, no 4, 2005

This article deals with how values are involved not only in what is done but in how

it is done. The article essentially treats design and technology but the corresponding line of reasoning is also valid for societal services: It is not only the total sum that is of significance but how the patient is treated, the degree of complexity, the predictability of the systems and their transparency. General ethical guidelines are thus challenged by situated ethics. Neither the medical model, focused on individual impairment and treatment, nor the social model, focused on ideological and political analyses provides a sufficient foundation for taking an ethical stand that considers the experiences of the person involved. It is, instead, the entire *chain* of design and technology and the entire *chain* of societal services in their context of usage that is relevant and decisive for situated ethics.

### III. On the Need of Validating Inpatient Databases.

Camilla Nordgren

Submitted to: European Journal of Epidemiology, 2006-04-07

This study examines the validity of an existing national inpatient care database comprising 495 persons with traumatic SCI. Relevant questions were identified in order to determine the usability of the material and to enable corrections of certain systematic errors. The beginning of the initial period of patient care correlated with the date of injury in only 62% of the cases. For the remaining 38%, the first registration date was between 2 and 8651 days after the date of injury. In other words, the data proved to be incomplete on this item. In addition, certain individuals had unmotivated short periods of care and all rehabilitation clinics were not included in the registration. At least 5 well-known clinics were missing, while 42 different hospitals and 47 different clinics were included in the statistics. All in all, the study demonstrates that extensive knowledge of the diagnosis group is required and of the group's inpatient utilization in order to scrutinize the data before it can be of use. In lieu of such an examination, prospective conclusions can be directly misleading.



## Material and Method

The research presented here is based on a good number of individuals who have incurred a traumatic spinal cord injury. Several sources have been used:

- Spinalis Outpatient Care Database, Stockholm County
- Interviews with an incidence group
- Information material from the nation social insurance office, municipalities, employment office, county labour board, insurance companies and foundations
- Swedish National Population Register
- Patient Database from the National Swedish Board of Health and Welfare

From Spinalis, the following data were retrieved for the incident group: personal identity number, date of injury, cause, level and extent of injury (Study 1). In 1997 and 1998, 48 persons incurred a traumatic SCI. Thirty-four of them were interviewed using a questionnaire. The dropout of 14 persons was due to death (n=2), declined to be interviewed (n=2), cognitive difficulties (n=3) or unavailability (n=7).

Data on the prevalence group of approximately 500 people was also retrieved from the Spinalis Database (Study III). To ensure quality, the group was checked to see if any were deceased, for their current domicile and for diagnosis verification by a practising physician at Spinalis. The domicile was considered to be important since it is assumed that if the person was not registered as being domiciled in the region investigated, he or she would not utilize health care services there. Such a check of the national population registry carried out in 2002 resulted in 31 individuals who were registered somewhere else both in and outside of Sweden. It could not be

traced if the individual had moved in and out of the region, however.

The inpatient care utilization of the prevalence group over time was studied using data from the National Swedish Board of Health and Welfare's Patient database [15]. In the processing of this material, a series of unexpected data were observed. A number of hypotheses were generated that were then tested by examining the database of the group of 495 persons (Study III).

### *Ethical permission*

For Study I, the Karolinska Institution's Regional Research Ethics Committee considered the project to be a quality follow-up, which is why it was outside of the Committee's scope. Ethical permission was obtained for Study II.

# Results

The complexity of the organization of societal services is illustrated in Figure 1.

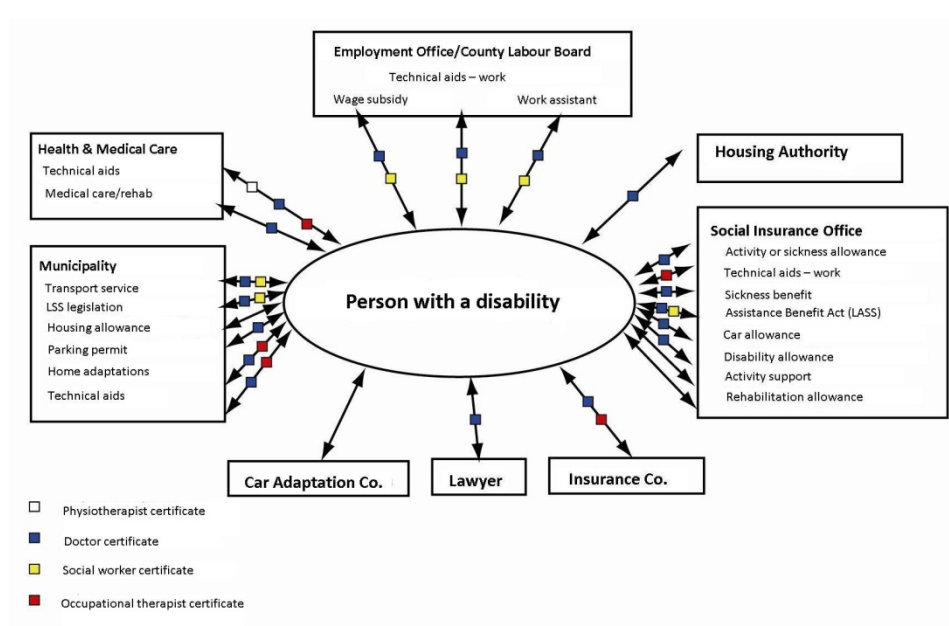


Fig 1. Possible societal contact network for people with complex needs

Several public authorities are included, three of which dominate: county/region, social insurance office and municipality. The large number of different types of support and service are also illustrated. It was found that the names of some forms of support changed over time; “disability pension” and “temporary disability pension” were replaced by “activity allowance” and “sickness allowance” in 2003. The organization, quantity and designation of the support or service as well as unfamiliarity in dealing with authorities in these kinds of contacts are all factors that affect how people with SCI experienced accessibility to support.

## *Applying for and receiving societal services*

In Sweden, a great amount of support, service and care is allotted to people who are in need. Study I reveals, however, that the number of services and their organization are difficult to grasp and cause considerable anxiety for the individuals affected. There is no existing structured and formalized information on all the support; one gathers this information by making inquiries instead. At the same time

since the support is complex, the individuals are often inexperienced in filling out forms and understanding the language of bureaucracy. The social worker at the hospital or rehabilitation centre plays a central role in providing information about the types of support, and assists the patient in the application process. Nevertheless, several of the people interviewed reported that they were unaware of certain available services, which indicates that the transfer of information about support and services is vulnerable. A number of applications were rejected, entirely or in part. This involved primarily disability benefits and car adaptations.

The interviewees were requested to estimate their level of satisfaction with the actual application process as well as the outcome. On the whole, the individuals were more satisfied with the outcome than with the way the errands were processed.

### *Methodological aspects of surveying societal services*

Members of the incident group with an injury acquired in 1997 or 1998 were interviewed using a questionnaire. Instead of asking what services they had applied for in a given year, all the services possible were listed for the interview persons in order to ensure that they had not forgotten any. They could choose from the following answers to the question, "Did you applied for xxx in 1998?":

"Yes."

"No. Why not?"

- a) Did not know about the service.
- b) Did not need the service in 1998.
- c) Already had the service.
- d) Other.

By interviewing an entire incidence group and not just the individuals who received a given service, it was possible to examine the reasons why a service was not utilized.

The prevalence group's inpatient utilization over time was examined using data from the Patient Database of the National Swedish Board of Health and Welfare. The Database in the region examined is complete from 1972 and those who were injured earlier (n=58) were excluded. Based on three questions, I was able to determine that the group's total inpatient utilization could not be established by means of the Patient Database. It was apparent that the Database first had to be validated, at least on the three essential criteria that this research had chosen (first hospitalization in relation to initial injury, length of care, inclusion of all clinics visited) in order to be able to use it.

### *Documentation of societal services*

Information about the utilization of societal services at the individual patient level is not collected in any one database or register in Sweden. Thus, such data has to be collected from primary sources (the individual) or from the existing isolated records. It is necessary when doing so to have considerable familiarity with the types of services that are currently available and appropriate in order to obtain a complete collection. The quality and relevance of the data or records that are supplied should always be checked. Study III describes the risk of using a database without first validating the contents. Drawing conclusions based on the assumption that a diagnostic group's utilization of inpatient care is the same as the contents of the database results in a considerable underestimation of the group's actual total utilization of health and medical care.

## Discussion

This licentiate thesis deals with the complexity in the organization of societal services and in the individual's utilization or non-utilization of health care, support and services in a life-long perspective. The focus here is on the individual with a traumatic SCI. The aim and approach, though, are also suited for other life-long illness or injuries that result in a disability and that are characterized by a similar complexity. The multifaceted societal system in combination with the complex effects of the injury result in considerable difficulties when the utilization of societal services from a life-long perspective is to be described.

Two extensive studies of resources and economic consequences after traumatic spinal cord injuries have been carried out by Berkowitz et al. [16,17]. The first focuses on determining prevalence in the USA and makes use of the COI method to compile the total cost of the condition. Close to 800 persons, randomly selected, were interviewed. The utilization of inpatient care was surveyed for the first two years after the injury occurred as well as one year before the interview. Other direct costs that were defined were for doctors and paramedic personnel, medication, personal assistance, technical aids and home adaptations. The investigators observed that considerable variation occurred in the initial inpatient care utilization, all of which cannot be explained by the level and extent of injury. Information about the inpatient stays came from subjects, 25% of which were injured before 1970. No discussion was included about the reliability of the answers or the reasonableness of the inpatient information. In the second study, 500 persons were interviewed over the telephone that were listed by a hospital as belonging to "the Spinal Cord Model Systems" as well as those who were members of the "Paralyzed Veterans of America". Direct and indirect costs were examined focusing particularly on home and car adaptations as well as wheelchairs.

No comprehensive study has been carried out in Sweden on this diagnostic group and the services utilized. Individual types of services have been examined by Levi et

al. [18,19] describing the utilization of prescription medicine and disability pensions/temporary disability pensions by 326 persons in Stockholm. They accessed the data through the annual Level of Living Survey (Undersökning av Levnadsförhållanden) distributed by Statistics Sweden.

Studying and surveying utilization of societal services requires that the analysis is carried out and presented in a timeframe. Legislation in the disability area has progressed from institutionalization to integration into the community. When the Act concerning Support and Service for Persons with Certain Functional Impairments, LSS, (1993:387) was passed, the individual's right to utilize societal services according to his or her needs and choice of life style was emphasized [20] (Assistance Benefit Act, LASS, 1993:389 as well). The individual's functional ability is only one of the factors that govern the service needs and utilization. In a Swedish government report on the treatment of persons with disabilities, Bengt Lingqvist reflects that the individual's values and expectations of what he or she has the right to influence treatment. This also applies to the case administrator's work situation, the system of complicated and unclear rules and regulations that are often modified, limited resources and changes in values [21]. Other examples of influencing developments and altered approaches are hospital care and self-care and their effectiveness, technology, policy, allocated resources and public attitude towards people with disabilities. An example of a political measure is the disability pension, which was intended to be given to individuals who for medical reasons had a reduced work capacity, but that from 1972 until 1990 was also given for purely labour market reasons [22]. An example of insufficient funding is the annual car allowance budget. In recent years, all the funds have been spent before the end of the fiscal year and late applicants have had to wait until the next fiscal year.

Studies I and III describe actual utilization in the population. It is not possible to tell from the data whether this corresponds to the individual's needs of care, support and service. It is important, however, to stress that need and utilization are

not always the same. Study I offers an indication that utilization would perhaps have been higher if the group that did not know about a given service had actually applied and received it. Jonsson et al. write that the amount of support from different actors / authorities / organizations makes it difficult for individuals to influence the kind of support and service that can be applied for and received [9].

Measuring and surveying utilized services is complicated for a comprehensive, life-long and complex condition. As previously described, a number of different authorities are involved and the types of support are many. Since the condition is life-long and many are young when the injury is incurred [14], and since their expected length of life is normal, the individual will be applying for and receiving different kinds of support and service for a long time. The support will vary depending on need and life situation. It is, as a rule, time limited and has to be applied for iteratively (e.g. a disability parking permit). In Sweden, one is only allowed to apply for a new care allowance every seven years. Other types of support can be applied for when there is an existing need but sometimes it is unclear how many times you will be able to receive it (e.g. home adaptation).

Despite the unique Patient Database, even inpatient care utilization proved to be complicated to assess. Figure 2 illustrates the many sources that have to be considered in order to establish the total inpatient care utilization in a prevalence group. The number of people who utilize health care and the extent to which they do cannot be determined from the available material in the studies presented here.



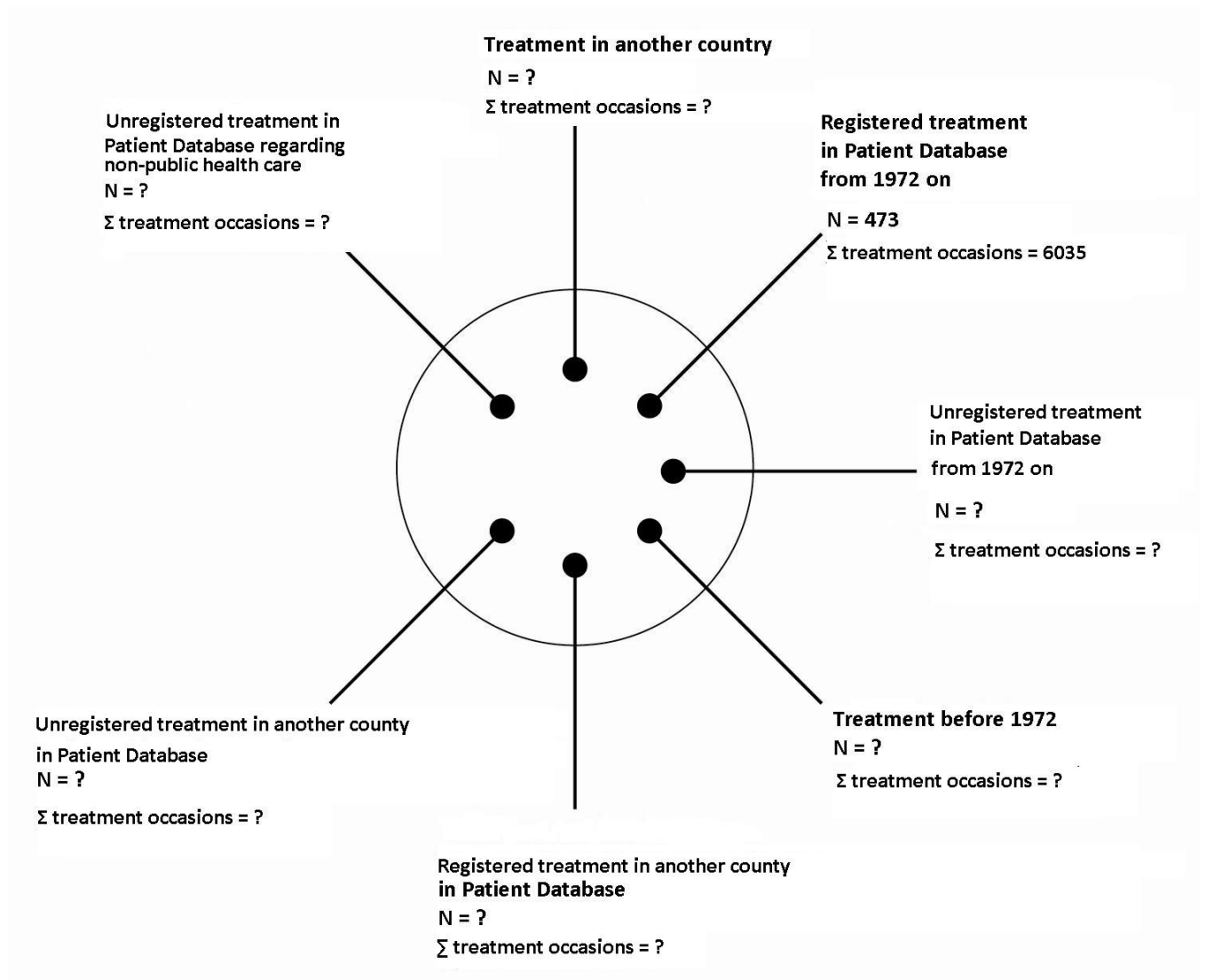


Fig 2. Sources for establishing the total inpatient care utilization for a prevalence group (n=489) up to and including 2002.

Today, there is no information on how individualized the resource needs are. If, for example, the degree of resource utilization correlates with the level and extent of injury is uncertain. Study I shows, however, that patients with a lumbar injury had the most applications.

## Conclusion

The studies show that Sweden has much support and many service resources that can be applied for by people with traumatic SCI. The organization of the services and their diversity complicate accessibility. What is important for the patients involved is how they are treated, the level of complexity predictability, of the system and its transparency. General ethical guidelines are challenged by situated ethics. It is the entire chain of societal services in context that is relevant and decisive for the situated ethics.

It is not possible to determine the total utilization of societal services for the group that was examined since the information is not available on the individual level. Interviews of a group of individuals were thus carried out regarding support and service. Inpatient care information was obtained from the National Swedish Board of Health and Welfare's Patient Database. Unfortunately, a validation of this database revealed that the data is incomplete, which is why the group's total inpatient care utilization can not be established.

## Continued Research

The in- and outpatient treatment visits for a prevalence group, and the service and support utilization of a representative selection of a prevalence group of traumatic SCI patients will be carried out with the aim of further surveying illness-related resource utilization according to the COI method.

The utilization profile will be examined by analyzing:

- Where in the life cycle the resource need arises.
- Why the need arises.
- If there is a correlation between service and support utilization and personal characteristics.
- Individual distribution of resource utilization.
- What authority/organization bears the costs.

In addition, there are plans to identify and compare the resource needs of a group of people receiving disability pensions due to traumatic SCI with an SCI injured group that is not receiving disability pensions.

## References

1. Levi R. The Stockholm spinal cord injury study: Medical, economical and psychosocial outcomes in a prevalence population (Doctoral thesis). Stockholm: Karolinska Institutet, 1996.
2. Dahlberg A, Kotila M, Leppanen P, Kautiainen H, Alaranta H. Prevalence of spinal cord injury in Helsinki. *Spinal Cord* 2005; 43(1):47-50.
3. van Asbeck FWA, Post MWM, Pangalila RF. An epidemiological description of spinal cord injuries in The Netherlands in 1994. *Spinal Cord* 2000; 38(7):420-424.
4. Biering-Sorensen F, Hansen RB, Biering-Sorensen J. Mobility aids and transport possibilities 10-45 years after spinal cord injury. *Spinal Cord* 2004; 42(12):699-706.
5. Lindquist U-C. Ro utan åror – En bok om livet och döden (Rowing without oars – A book about life and death). Stockholm, Sweden: Norstedts Förlag, 2004.
6. Brusén P. Livet en gång till – En ryggmärgsskadad möter svensk handikappolitik (Life one more time – A spinal cord injured person's encounter with Swedish disability policy). Malmö, Sweden: Égalité, 2005.
7. Jonsson D. Disability, rehabilitation and health economic assessment (Doctoral thesis). Linköping: Linköping University, 2001.
8. Shiell A, Gerard K, Donaldson C. Cost of illness studies – An aid to decision-making? *Health Policy* 1987; 8(3):317-323.
9. Jonsson D, Hass U, Persson J. The cost of the Swedish handicap service system – Implications for technology assessment. *Int J Technol Assess Health Care* 1995; 11(2):269-275.
10. Drummond MF, O'Brien BJ, Stoddart GL, Torrance GW. Methods for the economic evaluation of health care programmes. 2nd ed. New York: Oxford University Press, 1997.
11. Kobelt G. Health economics: An introduction to economic evaluation. 2nd ed. London: Office of Health Economics, 2002.
12. Hodgson TA, Meiners MR. Cost-of-illness methodology: A guide to current practices and procedures. *Milbank Mem Fund Q* 1982; 60:429-462.
13. Rice DP. Cost-of-illness studies – Fact or fiction. *Lancet* 1994;

344(8936):1519-1520.

14. Levi R, Hultling C, Nash MS, Seiger A. The Stockholm spinal cord injury study: 1. Medical problems in a regional SCI population. *Paraplegia* 1995; 33(6):308-315.
15. Patientregistret,  
[http://www.socialstyrelsen.se/Statistik/statistik\\_amne/sluten\\_vard/Patientregistret.htm](http://www.socialstyrelsen.se/Statistik/statistik_amne/sluten_vard/Patientregistret.htm). Stockholm, Sweden: The Swedish National Board of Health and Welfare. Accessed 2006-04-26
16. Berkowitz M, Harvey C, Greene CG, Wilson SE. The economic consequences of traumatic spinal cord injury. New York: Demos Publications, 1992.
17. Berkowitz M, O'Leary P, Kruse DL, Harvey C. Spinal cord injury: An analysis of medical and social costs. New York: Demos Medical Publishing, Inc., 1998.
18. Levi R, Hultling C, Seiger A. The Stockholm spinal cord injury study. 3. Health-related issues of the Swedish annual level-of-living survey in SCI subjects and controls. *Paraplegia* 1995; 33(12):726-730.
19. Levi R, Hultling C, Seiger A. The Stockholm spinal cord injury study: 4. Psychosocial and financial issues of the Swedish annual level-of-living survey in SCI subjects and controls. *Paraplegia* 1996; 34(3):152-157.
20. Peterson G. Specifik och generell lagstiftning (Specific and general legislation). In: Tideman M, (ed) *Perspektiv på funktionshinder & handikapp (Perspectives on disabilities and handicaps)*. Lund, Sweden: Studentlitteratur, 2000.
21. Lindqvists nia – nio vägar att utveckla bemötandet av personer med funktionshinder (The Lindqvist Nine Point Plan: Nine ways of improving the treatment of disabled persons). SOU 1999:21, Statens offentliga utredningar (Official Swedish Government Report), Socialdepartementet (Ministry of Health and Social Affairs), 2006.
22. Marklund S. Utträdet från arbetsmarknaden – utvecklingen av sjukfrånvaro, förtidspension och arbetslöshet i Sverige. (Leaving the labour market – developments in sick leave, disability pensions and unemployment in Sweden). In: Marklund S, (ed) *Rehabilitering i ett samhällsperspektiv (Rehabilitation from a societal perspective)*. Lund, Sweden: Studentlitteratur, 1995.

I



## SOCIETAL SERVICES AFTER TRAUMATIC SPINAL CORD INJURY IN SWEDEN

Camilla Nordgren,<sup>1,2</sup> Richard Levi,<sup>1,2,3</sup> Gunnar Ljunggren<sup>1</sup> and Åke Seiger<sup>1,2,3</sup>

From the <sup>1</sup>Neurotec Department, <sup>2</sup>Spinalis SCI Research Unit, and <sup>3</sup>Frösunda Center Research Unit, Karolinska Institutet, Stockholm, Sweden

**Objective:** Societal services after traumatic spinal cord injury in Sweden were investigated, including self-rated levels of satisfaction with the application process and resource allocation.

**Design:** Survey of an incidence population.

**Subjects:** Thirty-four persons of a total regional incidence population ( $n = 48$ ) with traumatic spinal cord injury.

**Methods:** Structured interviews using a standardized questionnaire.

**Results:** About 25 separate services were identified being available for persons with traumatic spinal cord injury. The average number of applications per person was 5 (range 0–11). The most common service was “transportation service”. Of the applications, 17% were partially or totally rejected. Most subjects received information about available services from a social worker. For 13 available services at least 1 subject claimed ignorance about its existence.

**Conclusions:** In Sweden, significant resources are allocated for allowing independence and financial compensation for individuals with traumatic spinal cord injury. However, this support system sometimes also results in frustration and disappointment. Insufficient information and co-ordination are reported as weaknesses. The persons’ efforts to acquire knowledge of how the system works take time which could be better used for rehabilitation and full integration into the community.

**Key words:** traumatic spinal cord injury, societal services, consumer satisfaction, application process, resource allocation.

J Rehabil Med 2003; 35: 121–126

Correspondence address: Camilla Nordgren, BSc, Certec, Box 118, SE-221 00 Lund, Sweden. E-mail: camilla.nordgren@certec.lth.se.

Submitted May 23, 2002; accepted November 19, 2002

### INTRODUCTION

A spinal cord injury (SCI) may have devastating consequences for the person affected and commonly leads to significant, permanent disability. The need for societal services is thus obvious and an extensive and life-long reliance upon such services will typically be established. In order to restore social integration, re-establish autonomy, compensate for functional losses and facilitate activities of daily living (ADL), society

provides various supportive services. Legislation regulates service availability by prioritizing those most in need. Services are administrated by several separate authorities, each with different organizations, objectives and cultures.

In Sweden, in addition to resources of a medical and rehabilitative nature, there are approximately 25 separate societal services potentially available for persons with SCI (Table I). Some of these services are mutually exclusive, but most are not and have to be applied for separately. In most cases, services are administrated by at least 2 different authorities, e.g. the regional social insurance office and the municipality. The employer and/or the Employability Assessment Institute may also be involved.

The population with SCI, however, often expresses dissatisfaction with this quite complicated system for service allocation (1, 2). Knowledge of the nature of this dissatisfaction is essential and its causes must be determined, described, analysed and fully understood in order to counteract it.

The relevance of factors such as demographics, injury characteristics and social support for community reintegration has been focused in earlier studies, e.g. by Whiteneck et al. (3). The issue of societal services, however, has not been closely investigated.

An SCI involves costs that are carried to varying degrees by the person involved, his/her social network and society, respectively. The most evident and easily identifiable cost is that of initial hospitalization. Several authors (4–7) have estimated initial and subsequent life-long direct and indirect costs. Berkowitz et al. (4) and Walsh (6) found, *inter alia*, that the costs of initial hospitalization constitute only a minor part of the total SCI cost. Since the services provided by society in most cases are iterative and life-long, they will represent a large part of the total costs.

A first step towards service allocation is an application. Each service has to be applied for separately by the applicants themselves. In most cases certificates from a doctor, social worker and/or occupational therapist are required in order to corroborate the person’s conditions and/or application. The case is then processed and decided upon at the regional office and the applicant is notified of the decision. The decision can be appealed against.

Little is known about how the applicant experiences this process. The widespread use of patient satisfaction measures has not yet, to our knowledge, been applied in this field. Both the application process and its outcome are of relevance in this context.

The purpose of this study was to identify the spectrum of



Table I. Societal services and criteria for allocation

Service	Criteria for allocation
Disability pension	Chronic illness or disablement and therefore inability to work
Temporary disability pension	Reduced working capacity for a limited period
Sickness allowance	Illness and therefore inability to work
Disability allowance	Need for time-consuming help from somebody in order to manage daily living, job or studies or substantial additional costs
Training allowance	Taking part in a labour market programme
Rehabilitation allowance	Undergoing rehabilitative treatment with a view to restoring employability
Wage supplement	Employing a person with reduced work capacity (a subsidy for the wage disbursed to the employer)
Assistant (while at work)	Letting an employed person at the working place help a disabled person with simple duties (a subsidy for the wage disbursed to the employer)
Technical aids	Need of technical aid due to the disablement at the working place
Work adaptation	Need of adaptation due to the disablement at the working place
Priority to an apartment	Social or medical reason for prioritizing in a housing queue
Housing allowance	Additional costs for the rent due to the disablement
Home adaptation	Need of adaptation in the home due to the disablement
Car allowance	Difficulties in transporting oneself or using public transportation
Car adaptation	Need of adaptation due to the disablement
Parking card	Difficulties in walking (permit parking on special places)
Transportation service	Difficulties using public transportation within the community
National transportation service	Difficulties using public transportation within the nation
Attendance allowance	Severe disability and necessity of personal assistance with basic needs, i.e. personal hygiene, dressing/undressing, eating, communicating with others, in daily living situations
Home help (service)	Need of help with, e.g. cleaning, laundry, providing meals
Home nursing service	Need of help with, e.g. changing bandage, medication
Escort service	Need of assistance while performing recreational activities

potentially relevant societal services early after SCI and analyse user satisfaction with the application process and resource allocation.

## METHODS

In the years 1997 and 1998, 48 persons in the Greater Stockholm area and on the island of Gotland, Sweden sustained a traumatic SCI. The study group comprised 34 (71%) of these individuals. Fourteen persons were unable to participate in the study, out of which 2 had died, 2 declined, 3 suffered from cognitive limitations and 7 could not be reached. With regard to gender, age at injury and level of lesion, no differences were found between the study group and the excluded group.

Demographic data were obtained from the Stockholm SCI database (8). This database is a medical record system, which was adapted and implemented in the early 1990s as an instrument for structuring investigations, data storage and processing of patients with SCI. Descriptive data for the study group as regards level and completeness of lesion, according to the American Spinal Injury Association (ASIA) (9), are depicted in Table II. The group comprised 11 women and 23 men. Mean age at injury was 47 years (range 15–76, SD 17, median 48 years).

The criteria for being eligible for resource allocation, such as income, expenses, age or extent of disability were not investigated. It is therefore not possible to exclude any individual. The purpose of this study was to investigate an incidence group in order to illustrate the actual situation.

A questionnaire was constructed for the interviews, which were performed by one of the authors (CN) who had no connection with any of the authorities nor any professional contact with the social workers. The interviews took place between November 1999 and February 2000 and lasted between 20 minutes and 2 hours. The time was dependent on the number of services that were applied for and the complexity of the processing. The questionnaire comprised 2 parts. The first surveyed which services the persons had or had not applied for during 1998. The second focused on the application process as such and to what extent the resulting service allocation was in accordance with what was applied for and on the level of satisfaction with regard to administrative handling.

Whenever a person had not applied for a service, 3 possible reasons were identified: (i) the person was already receiving the service; (ii) the person did not claim to need the service in 1998; or (iii) the person did not know about the service.

Questions about the application process included information about available services, request for certificates, contact with the administering authority, level of resource allocation, degree of satisfaction, information about the possibility of appealing and time from decision to delivery. The degree of satisfaction with resource allocation was assessed on a 4-point self-rating scale (1, not at all; 2, to a limited extent; 3, to a large extent; and 4, completely). A 7-point self-rating scale was used in order to measure the degree of satisfaction with the administration of the application (1, worst ever; 2, very bad; 3, bad; 4, pretty good; 5, good; 6, very good; and 7, best ever).

## RESULTS

The study group applied for 175 services during 1998, with a range of 0–11 and an approximate average of 5 applications per person. No significant difference in the average number of

Table II. Neurological classification

Neurological level of lesion	Total		Complete <sup>a</sup> <i>n</i>	Incomplete <sup>b</sup> <i>n</i>
	<i>n</i>	%		
Cervical	18	53	2	16
Thoracic	3	9	0	3
Lumbar	7	21	0	7
No level <sup>c</sup>	6	17	0	0
Total	34	100	2	26

<sup>a</sup> American Spinal Injury Association (ASIA) A; <sup>b</sup> ASIA B-D; <sup>c</sup> No residual sensorimotor deficit that makes it possible to identify the original lesion, ASIA E.

Table III. Number of applications during 1998 vs level of lesion

Number of applications	Level of lesion			
	Cervical <i>n</i> = 18	Thoracic <i>n</i> = 3	Lumbar <i>n</i> = 7	No level <i>n</i> = 6
0	2	0	0	0
1	1	0	0	2
2	1	0	0	0
3	3	1	1	0
4	1	0	0	4
5	2	0	0	0
6	0	1	2	0
7	3	0	0	0
8	0	1	2	0
9	1	0	0	0
10	4	0	1	0
11	0	0	1	0

applications could be found between women and men. The number of applications in relation to level of lesion is illustrated in Table III. Persons with lumbar injuries showed the highest number of applications per person and persons with no level, the lowest.

#### Category of service

Table IV shows the distribution of applications for the different

services. The most common service applied for was "transportation service" (*n* = 31) followed by "home adaptation" (*n* = 17) and "sickness allowance" (*n* = 16). Ten persons answered that they did not know about the "disability allowance" service and 7 did not know about the "national transportation service". None had applied for "wage supplement" or "assistant (while at work)".

#### Handling and outcome

The subjects were asked to rate their degree of satisfaction with the administrative routines, including the attitudes and behaviour of the authority representatives, the time interval from submission of the application to decision, the quality and extent of pertinent information and the resource allocation. Table IV depicts the results of the maximal ratings of these questions. For the services "car allowance" and "car adaptation" only 1 person out of 11, and 1 out of 9, respectively rated the handling as "Best ever" or "Very good". Generally, subjects were more satisfied with outcomes than with the handling process as such.

#### Information about the service

One piece of information extracted from the questionnaire was that the vast majority of the study group was informed about available services by a social worker at the hospital or rehabilitation clinic. The social worker typically handled the

Table IV. Distribution of service applications 1998 and ratings of handling and outcome by category (*n* = 34)

Service by category	Yes <i>n</i>	Handling <sup>a</sup>	Outcome <sup>b</sup>	Already receiving 1998 <i>n</i>	Did not need 1998 <i>n</i>	Did not know about the service <i>n</i>
		Best ever and Very good <i>n</i>	Completely and To a large extent <i>n</i>			
<b>Income support</b>						
Disability pension	3	2	2	4	25	2
Temporary disability pension	6	5	4	1	26	1
Sickness allowance	16	7	14	0	17	1
Disability allowance	13	6	7	0	11	10
<b>Work</b>						
Training allowance	1	1	1	0	29	4
Rehabilitation allowance	7	4	6	0	27	0
Wage supplement	0	0	0	0	34	0
Assistant (while at work)	0	0	0	0	34	0
Technical aids	7	6	7	0	27	0
Work adaptation	1	1	1	0	33	0
<b>Accommodation</b>						
Priority to an apartment	8	8	8	0	25	1
Housing allowance	8	6	6	0	24	2
Home adaptation	17	7	12	1	16	0
<b>Transportation</b>						
Car allowance	11	1	9	0	20	3
Car adaptation	9	1	5	0	23	2
Parking card	14	13	13	0	18	2
Transportation service	31	29	30	1	2	0
National transportation service	5	5	4	0	22	7
<b>Attendance</b>						
Attendance allowance	6	3	5	0	27	1
Home help (service)	9	6	7	0	24	1
Home nursing service	2	2	2	0	32	0
Escort service	1	1	1	0	33	0

<sup>a</sup> Ratings possible: Best ever, Very good, Good, Pretty good, Bad, Very bad, Worst ever; <sup>b</sup> Ratings possible: Completely, To a large extent, To a limited extent, Not at all.

application and requested doctors' certificates as well. For some services, such as "parking card" and "transportation service", the social worker was typically in charge of the whole application process and the outcome for the person with SCI was a letter containing the "parking card" or licence for "transportation service". For other services, the social worker assisted initially in the application process, whereas subsequent phases of the process involved direct contact between the representative of the relevant authority and the person in need.

#### Resource allocation

An application being made is no guarantee of a service being granted. The outcome of an application for services is either provision of the service or partial or total rejection. A "car adaptation" application can, for example, be partially rejected when all adaptations applied for are not granted. The authority representative has then made a judgement that the applicant does not fulfil the criteria for the allocation. Table V gives an overview of partially or totally rejected applications in the study group. Seven persons (out of 13) received a partial or total rejection of an application for "disability allowance". The corresponding figure for "car adaptation" was 7 (out of 9).

#### Three narratives

In order to illustrate inter-individual variations as well as intra-individual complexity of the administrative handling process, narratives of 3 plausible cases are presented.

#### Case 1

Bill sustained his C5, ASIA B injury in a motorcycle accident at the age of 30 years. He was a gym trainer at the time of injury, he lived with his wife in a single-storey house. She contacted the social insurance office soon after the accident to arrange for "sickness allowance". Bill felt too sick to participate at that time. His wife reported that the administrator seemed to lack insight into Bill's predicament and was unhelpful. Bill felt the administrator to be ignorant about his situation. However, the allowance was provided immediately and Bill rated his satisfaction with the handling as 5 and the outcome as the maximum 4.

Table V. Partially or totally rejected applications. Number and percent of total number of applications for each respective service

Service	Applications	
	No. rejected	% of all
Disability allowance	7	54
Priority to an apartment	1	12
Housing allowance	2	25
Home adaptation	4	24
Car allowance	3	27
Car adaptation	7	78
Parking card	1	7
Attendance allowance	2	33
Home help (service)	2	22

The hospital social worker informed Bill about "disability allowance", to be handled by another administrator than the one handling "sickness allowance". Bill provided much the same information again and this duplication in reporting was further emphasized by the involvement of 2 or 3 additional administrators. The handling of the application, however, did not take long and Bill rated it as 5 and the outcome as 4.

The hospital social worker also informed them about "home adaptation". Bill's wife helped him to contact the municipal department. Its administrator failed to grasp what needed to be done and why in spite of drawings being provided. When 2 weeks remained of his 5-month in-patient stay at the hospital no adaptation had yet been carried out. When Bill called attention to the cost of additional in-patient care, things started to happen. Bill rated the handling as 1 and the outcome as 4.

Bill also became aware through the social worker of the possibility of applying for a "car allowance" and "car adaptation". Bill found the administrator at the social insurance office unable to understand the importance of an accessible car. Bill and a car dealer therefore had problems filling out the forms properly. Then funds were temporarily low and the allowance was transferred with a delay. Bill rated the handling as 1, the outcome of the "car allowance" as 3 and the "car adaptation" as 1 since he did not get all the required adaptations. The social worker also helped Bill apply for a "parking card", which he received immediately. The handling and the outcome were both rated maximally.

Bill applied for "personal assistance" after information from the social worker at the rehabilitation clinic. The administrator showed little sympathy for the requested amount of assistance. However, Bill was content with the outcome and rated it as 4. The handling was also rated as 4.

#### Case 2

Karl sustained his L3, ASIA B SCI when he fell from a tree, while picking cherries at the age of 50 years. Being a teacher Karl contacted the social insurance office about the "sickness allowance", which was administrated immediately and he rated the outcome as 4 and the handling as 7. The administrator of the "sickness allowance" informed him of the "disability allowance" and the administrator who dealt with this. Karl found a need to exaggerate his functional disability rather than showing rehabilitation results. The allowance was less than applied for and did not cover his extra costs, so he rated the outcome as 1. The handling was rated as 3.

The social worker and the occupational therapist at the hospital informed him about "home adaptation". Karl applied to the municipal administrator but was not granted all the adaptations he considered necessary. He rated the outcome as 2 and the handling as 6. Karl decided to obtain all the adaptations anyway and thus paid for some of them himself.

The social worker at the rehabilitation clinic informed him about "car allowance" and "car adaptation". Additional information was provided by a company dealing with car adaptations. Karl was completely satisfied with the outcome of the "car

allowance”, but rated the outcome of the “car adaptation” as 2 since his application was partly rejected. Karl rated the handling for the allowance and the adaptation as 4. Karl also applied for a “parking card”. He was informed by the social worker and the card arrived within 2 weeks. The outcome and handling were both rated maximally.

### Case 3

Anna sustained a C5, ASIA C injury at the age of 45 years when her bicycle collided with a car. She was married and the mother of 3 children. Anna’s husband and the hospital social worker helped her to make contact with the social insurance office to apply for “sickness allowance”. Later Anna also applied for a “rehabilitation allowance”. She rated the outcome as 4, while the handling was affected by insufficient information and rated as 4.

The hospital social worker helped Anna to apply for a “disability allowance” through the social insurance office. The application was approved and the payment arrived immediately. Anna rated the outcome as 4 and the handling as 6. The social worker also handled the “home adaptation” application. The adaptations were performed without delay and Anna rated the outcome as 4 and the handling as 7.

The rehabilitation clinic informed her about “car allowance”. The outcome was satisfactory and was rated as 4. However, the information was delayed and the handling was therefore rated as 5. Anna was also told at the clinic about “car adaptations” and experienced the lack of comprehensive information assembled in one place. The formal application was made by telephone and the outcome was rated as 3. The handling was also rated as 3. On Anna’s behalf the social worker applied for a “parking card”, which Anna received by post. The outcome was rated as a maximum 4 and the handling as 6.

The hospital social worker dealt with the application for “personal assistance”. The outcome was rated as 4. However, the implementation was late and the handling was therefore rated as 4.

## DISCUSSION

The present study reflects that several societal resources are available to individuals with SCI in Sweden soon after the injury. Only a few of these resources are utilized by the majority of the SCI study group.

There is no formal, structured information provided by society about services available to individuals who have sustained a disability. The authorities provide information on request. None of the above-mentioned services are placed at the SCI person’s disposal automatically; every service requires some kind of application. Social workers at the hospitals or rehabilitation clinics typically arrange help for persons with SCI. The fact that a number of the study group individuals did not know about particular services indicates that this routine is vulnerable. This suggests that services that the persons are entitled to may not be granted, due to poor information, or because the social worker judges that the applicant does not

fulfil the criteria for the service to be granted. This result shows the importance of examining a total prevalence group in order to determine the experiences not only of persons who are “in the system”.

Many subjects indicated that they did not need the service in 1998. One interpretation is that they did not consider the service necessary in compensating for the disability. Another is that they did not require the service in 1998 (but maybe did later on). A third interpretation is that the individual with SCI was already receiving another service, mutually exclusive to the one required. Still another interpretation is that the family was providing the service. The fact that the degree of service depends mainly on income, expenses, age or extent of disability, may explain why some persons do not apply for the service. They are aware of this regulation and know that they are not eligible. Such individuals also answered that they did not need the service in 1998. It should be emphasized that it is not possible to determine the total need of services for the study group by considering only the granted services, since regulations and/or insufficient information exclude some persons with needs.

Persons with lumbar injuries made the highest number of applications. Comparisons between level of lesion on one hand and quality of life and medical problems on the other have been reported earlier, see, for example, Westgren & Levi (10) and Levi et al. (11). Since many services are provided in order to compensate for the disability, one might assume that those with higher injuries, and thus more extensive impairments, would also have had more need of services and consequently applied for more. It is not possible in this study to establish a statistically significant correlation between the number of applications for services and the level of lesion, but the result is still worth noting.

The study population more frequently reported partial or total rejection of their applications for the services “disability allowance” and “car adaptation”. One explanation for this may be a significant component of subjective judgement on the part of administrative staff based on indistinct legislation. The reported number of rejections was only for formal applications. Since many intended written applications start with a telephone contact with an administrator, this may result in verbal discouragement. Such inhibiting effects are difficult to estimate, both in number and impact on the life of the person affected.

Living with an SCI poses several obstacles in daily life. Overcoming these is time consuming. For the affected individual with the intention of living fully integrated in society with work, family and leisure activities, time thus becomes a problem, i.e. the impairment leads to less time being available. For most individuals with new SCI, contacts with and knowledge of the social welfare system are new experiences. There is a complicated system of rules, which is often dependent on the budgeted resources. The necessity of acquiring knowledge of this system demands effort and time. In most cases the social worker assists the individual, resulting in a more effective handling. As most services have a time limit and must be applied for iteratively, the disabled individual typically has to re-apply

without continued support from the social worker. Post et al. (12) showed in a study from the Netherlands that a majority of respondents rated satisfaction with service delivery procedures as low, especially factors such as attitude, number of organizations and officials involved and the amount of time required for these procedures.

If the person with SCI unequivocally fulfils certain criteria for receiving the service an application may be considered as a "reservation". This is valid for such services as "parking cards" and "sickness allowances". From the SCI person's perspective, verification comes in the delivery of the card or payment in response to the application. For other services such as "home adaptation" and "disability allowance", the application is but a first step towards a further assessment of the needs. Such a procedure may require considerable time and patience. The difference between these 2 ways of handling an application may be confusing and misleading to the person in need. Keith (13) showed that research in healthcare generally demonstrates high levels of satisfaction and that dissatisfied patients tend to seek other providers. For a person in need of societal services, however, there are few if any alternatives. This creates a double "lock-in", firstly because of the rules and judgements and secondly because there may be no other provider.

The questionnaire included an inquiry about handling time. Post et al. (12) found that discharges for one-third of the respondents from the rehabilitation centre in the Netherlands were delayed because residential adaptation was not completed, while the corresponding figure in Forrest & Gombas' study (14) was 10%. In our study one person reported a similar situation. A certain degree of adaptation of the home is often necessary before discharge. However, it is likely that further modifications will need to be carried out when the person with SCI has settled in.

An holistic approach to rehabilitation needs to include the entire process of returning to independent living. Today, different organizations are responsible for different parts of the rehabilitation and reintegration for SCI individuals. An initial period of hospitalization with the objective of minimizing the impact of the injury and optimizing the conditions for long-term survival with good quality of life must, however, be enhanced by the authorities responsible for services meeting the objective of rehabilitation for full community reintegration. If this enhancement does not succeed, many of the resources invested in the initial phase will not be as useful and effective as expected.

In conclusion, the social security system in Sweden has allocated significant resources for allowing independence and financial compensation for SCI-related impairments. The number of services available reflects this notion. However, this study shows that the present state of affairs often creates frustration and disappointment on the part of the disabled person. The complexity of the system is often reported as a

shortcoming within the entire disability movement and not only within the SCI sphere. The problem is the same for all affected, but it might have greater impact for those persons acquiring a complex, life-long injury/sickness. In spite of the social worker's role as a co-ordinator between the authority and the person in need, insufficient information and co-ordination are reported as examples of weaknesses. In order to achieve a fully satisfactory system of societal services either the number of processes and authorities must be reduced, or an official co-ordinator must be appointed, with the explicit task of acting as a proxy for the person in need. The task must be determined without delay so that the person with SCI is given the opportunity to be properly supported throughout life.

## ACKNOWLEDGEMENTS

This study was supported by grants from The Swedish Association of Neurologically Disabled and The Spinalis Foundation. Ms Nordgren was partly supported by The National Board of Health and Welfare and Stockholms Sjukhem Foundation. The authors thank Mr Petter Gustavsson, PhD, for statistical advice.

## REFERENCES

1. Lindqvists nia—nio vägar att utveckla bemötandet av personer med funktionshinder (Nine ways to develop the treatment of persons with disability.) [summary in english]. Statens offentliga utredningar, Socialdepartementet. SOU 1999: 21.
2. Jarkman K. A life to live. Families, disabilities and everyday conditions. Dissertation. Linköping: Linköping University, 1996.
3. Whiteneck G, Tate D, Charlifue S. Predicting community reintegration after spinal cord injury from demographic and injury characteristics. *Arch Phys Med Rehabil* 1999; 80: 1485–1491.
4. Berkowitz M, O'Leary PK, Kruse DL, Harvey C. Spinal cord injury: An analysis of medical and social costs. New York: Demos Medical Publishing, Inc., 1998.
5. DeVivo MJ. Causes and costs of spinal cord injury in the United States. *Spinal Cord* 1997; 35: 809–813.
6. Walsh J. Costs of spinal cord injury in Australia. *Paraplegia* 1988; 26: 380–388.
7. Johnson RL, Brooks C, Whiteneck GG. Cost of traumatic spinal cord injury in a population-based registry. *Spinal Cord* 1996; 34: 470–480.
8. Levi R, Hultling C, Westgren N. A computer assisted follow-up system for spinal cord injury patients. *Paraplegia* 1994; 32: 736–742.
9. Ditunno J, Young W, Donovan W, Creasey G. The international standards booklet of neurological and functional classification of spinal cord injury. *Paraplegia* 1994; 32: 70–80.
10. Westgren N, Levi R. Quality of life and traumatic spinal cord injury. *Arch Phys Med Rehabil* 1998; 79: 1433–1439.
11. Levi R, Hultling C, Seiger Å. The Stockholm spinal cord injury study: 2. Associations between clinical patient characteristics and post-acute medical problems. *Paraplegia* 1995; 33: 585–594.
12. Post M, van Asbeck F, van Dijk A, Schrijvers A. Services for spinal cord injured: Availability and satisfaction. *Spinal Cord* 1997; 35: 109–115.
13. Keith RA. Patient satisfaction and rehabilitation services. *Arch Phys Med Rehabil* 1998; 79: 1122–1128.
14. Forrest G, Gombas G. Wheelchair-accessible housing: Its role in cost containment in spinal cord injury. *Arch Phys Med Rehabil* 1995; 76: 450–452.

II



## ethics in the making

**Bodil Jönsson, Peter Anderberg, Eva Flodin, Lone Malmberg, Camilla Nordgren & Arne Svensk**

Applied ethics in research is no longer regarded as a concern exclusive to the medical field. Exemplars in ethics from other fields such as design are, however, meagre, as are relevant practical and design applied guidelines. The more ethically grounded a given area of research is, the greater the chance it can contribute to long-term, meaningful breakthroughs in knowledge. An improved *ethics in design* can enable a critical questioning that in turn leads to entirely new research questions.

The mere involvement of human subjects and the application of safety provisions in design research do not guarantee it will meet ethical considerations, best practices or standards. The entire complex interaction with users offers intriguing possibilities and risks, or can result in mediocrity in areas such as: preparation and implementation that is worth the research person's time; respect for users' contributions; dignified treatment; feedback in an iterative and interactive process with mutual information and inspiration; and products and processes that are truly influenced by the users. This reasoning applies to all, but with special distinction to people who are disabled and elderly. Starting with specific needs as opposed to more general ones (the latter of which result in the necessity for more abstract specifications for the multitudes) can, above and beyond the ethical dimension, also result in increased innovation and effectiveness for society on the whole. Proceeding from the particular to the general is of considerable value, for ethical reasons as well as for sheer effectiveness.

Involving persons with a variety of disabilities in product development helps to ensure innovative and useworthy products.[1] One of many prerequisites for ethically sound user involvement is that all participants are aware of the interference taking place in an iterative design process.

An elaboration of ethical aspects in design can be valuable for different stakeholders (user organisations, NGOs and the design community) and, of course, for the relevance of resulting products and processes. A more considerate ethical approach could have substantial economical value due to the higher relevance of the results. There has been a considerable increase in the ethical expectations placed on businesses and professions in recent years. Scores of organisations have reacted by developing ethical codes of conduct and professional guidelines to explicitly state their values and principles.[2] Moreover, the drafting of a code of ethics can be seen as an indication of professionalism in an emerging profession.[3]

### **Ethical guidelines versus situated ethics**

Traditionally, medical research and clinically practicing professionals have been in the vanguard of creating ethical guidelines, with other research fields involving human subjects and human well-being close behind. Today, the medical disciplines are also front runners in combining their work on general ethical principles (autonomy, justice, and beneficence, for instance) with research on situated ethics, which is less mechanistic and closer to the context of real people in actual situations and work practices.

Situatedness urges different approaches for different disciplines. The engineering and design sciences, having safety, accessibility and 'universal design' of artefacts and the built environment on their agenda, cannot lean towards medical exemplars. They need to develop their own. An initial difficulty is that the existing key ethical principles, however 'universal' they appear to be, originate from medicine. The spirit of the *Nuremberg Code*, the *Helsinki Declaration* and *The European Convention* (with its explanatory report) is not particularly vitalised in design, to say the least.[4], [5], [6] The reason is obvious: none of them have been formulated based on experiences from design of civil products for everyday life. Nonetheless, ethical aspects are definitely present in test usages as well as in the influence of the resulting technology in later, everyday use.<sup>3</sup> Ethical design perspectives can also be deduced from *The Charter of Fundamental Rights of the EU* ('the right to freedom of expression and information'), [7] the *Convention on the Rights of the Child*, [8] and from *Citizens Rights and New Technologies: A European Challenge* in which the European Group on Ethics in Science and Technologies (EGE) stresses the two basic concepts of *dignity* and *freedom*. [9] Accessibility and 'design for all' are such fundamental perspectives that they should not be treated separately. They have societal implications for education, information and participation in social and political processes. *The Principles of Universal Design*, with the approach that environments, services and products should be designed for use by as many people as possible regardless of situation or ability, is an example of this perspective.[10]

Creating common guidelines for rehabilitation design is a challenge, as is the possibility of working the other way round: to open up for a mainly *situated ethics*, based on the spirit of existing codes and declarations rather than being deduced from them. The core of situated design ethics is made up of means and methods that (using the



main declarations as guidance) reveal the most important ethical aspects in a given situation, elaborate these, document the thoughts, their implementations and outcomes and make them openly available with the goal of yielding exemplars and inspiring a vital and on-going discussion.

### **Exemplar 1: You have to have options to make a choice**

Hanna was born with a nerve-muscle disease that severely restricts her mobility. At 1½ years of age, she received her first standing support device in order to exercise her muscles and put pressure on her skeleton. In the process of standing, however, she discovered that there was a lot to see from this upright vantage point. Objects in other parts of the room caught her attention. Without the support of her mother's arms she was suddenly on her own in the world. She wanted to come closer to the objects that she could see at the edge of her upright horizon. Her mother had to move the stationary supporter to the thing that attracted Hanna's attention. 'There! There!' she said and pointed. She quickly focused on something else and wanted to move on to it and then the next object and the next. Her mother soon realised that this was not so much about Hanna's wish to interact with different objects: what she actually was after was the enjoyable feeling of moving around in an upright position. This resulted in the construction of a motorised standing support device that offered Hanna the opportunity to move around in an upright position on her own.

One such device after the other has seen the light of day and enabled Hanna, now a young adult, to gain the identity of a standing – not a sitting – person, including all the existential, physical and practical effects and side effects involved. One such side effect (that was foreseen) is that Hanna will never master the ability to sit – she will remain a standing or a lying person for the rest of her life. The critical moment is to be found in her early childhood when the people in her surroundings were open-minded enough to start questioning whether a future position as a seated person would be right for Hanna with her 'stand-up' ambitions.[11], [12]

This exemplar might serve as a revelation: what are the ethics (if any) behind the dominating 'wheel-chair-for-all' attitude that in no way questions the underlying assumption that somebody who cannot stand up and walk on her own has to live her life primarily as a seated person? In design terms: what are the ethical issues involved in not offering motorised standing supports as an option for mobility injured people? It is easy to understand that an aid in the best of cases does not only fulfil the function it is meant to (to stand up in the example of Hanna); it can also reshape the person's existence and existential terms (Hanna achieved an autonomous, upright mobility). This aspect should be involved in future body technology.[13]

In design, the focus might be on 'that-which-ought-to-be' (*desiderata*) versus 'that-which-is' (description and explanation).[14] The concept of *desiderata* is an inclusive whole of aesthetics, ethics and reason. *Desiderata* is about what we intend the world to be, which is more or less the voice of design. The greater the difference between the designer's and the user's worlds of concepts, the greater is the need for a user-adjointing and situated design process. You need to immerse yourself in concrete experiences – not only base your understanding on abstract ones. You need to accept and acknowledge the existence of different communities of practice.[15] You need to accept desire as an initiator of change. You need to allow disturbances and not only inform and be informed, but also inspire and be inspired. Designers may be informed and inspired by the users, at the same time as the users are informed and inspired by the designers. Utilising this two-way information and inspiration in both groups to its full extent has profound ethical implications, while at the same time making the process more efficient and situated. Cf. the framework by Kensing and Munk-Madsen.[16]

### *Cultural probes*

Among situated design methods, cultural probes have a special position and they have developed in two primary directions: the inspirational and informational. The pioneer version of cultural probes belongs to the first direction. It was developed at the Royal College of Art, Computer Related Design by Bill Gaver and focuses on novel forms of self-reporting by participants on details of their everyday lives. These are then taken up to inspire the design process. The group of academic and artistic members were working on redesigning three community sites in Norway, Holland and Italy. The idea behind these probes was to provoke inspirational responses from elderly people living at the sites.[17], [18], [19]

The informational direction of cultural probes developed out of the design research community oriented towards use of ethnographical methods in the design process. Pioneers in this usage of cultural probes have been members of the Cooperative Systems Engineering Group, Computing Department, Lancaster University in the UK, which has extensive experience in the use of ethnography in design.[20]

We believe that the "friction" contained in the probe's design also works as a way of inspiring users to create new use situations and to look at their environment in a new way – with new glasses.

In interactive design processes involving people with extensive language limitations, questionnaires and interviews are extremely blunt instruments for capturing people's dreams, needs or aversions. Cultural probes

are many times preferable in this context because they do not require specific prerequisite knowledge or language abilities. We introduced a number of probes in a day activity centre for people with cognitive and communicative limitations. The reactions to these cultural probes have both inspired and surprised us.[21]

### **Example: Cultural probes as a source of inspiration**

One probe was a web camera for communication. During the initial connection, the sound disappeared so the researcher and day activity centre participant could only see one another on their respective computer screens moving their lips. The researcher quickly telephoned the person at the day activity centre (the phones were next to the computers) and on the screen the two of them could see each other sitting there holding the telephone receivers to their ears and talking. From the facial expression of the person at the centre, it was obvious that this was a true “Aha!” experience. It took a while before the researcher realised that the surprise was because this was the first time the person in question had actually seen what it was like for the person at the other end of the line. Since then, the two take turns phoning one another even though the sound works on the computer because the feedback the user receives from using the telephone and from seeing the person he is talking to doing the same, provides him with more clues to the mystery of telephoning.

### **Design ethics and the human sector**

To smash the little atom,  
All mankind was intent.  
Now every day,  
The atom may  
Return the compliment.

Max Born, Physicist, Nobel Prize Winner, 1882-1970

State-of-the-art in design ethics has been well elaborated in another issue of *Design Philosophy Papers*, particularly in the articles by Donahue and Fry.[22], [23] Addressing ethics makes it possible to discuss what design does, what it contributes and what designers may affect in their work. As Tonkinwise puts it, ethics has always been associated with human-to-human relations.[24] But, according to Latour, artefacts are society and culture made sustainable.[25] Products, artefacts, built environments and communication are also ‘actants’ themselves and therefore enter the ethical domain not only as neutral means used by humans in their relations to other humans. Using an analogy from physics, Bruno Latour finds in designed activities what he labels ‘the missing masses’, which is to say that if we only take into account what we currently understand by ‘sociality’, our cultures should have long since collapsed into irretrievable immorality. The ‘missing masses’ names an ethical force hidden beyond what we now call ‘the social’, and the force is in the things per se. Things are acculturating or ethos-generating and a vital part of any ethos with a future.

In the *human sector* people work with and for other people. In addition to healthcare, schools and social services, this sector comprises people-to-people operations in business, the rest of society and the large, informal sector/economy in which people help people because they are relatives or friends. Awareness of the role of artefacts and design of new artefacts requires design processes that proceed from the *logic of the human sector*, not the technical one as is the case in the electronic, manufacturing and forest industries. With another approach to humans in design, the opportunities for real participation of people with disabilities increase, as do their opportunities to make decisions on their own.

The design of a new technology can have a strong impact on the human sector and help improve it.

### **Exemplar 2: Being there**

The following excerpts from Peter Anderberg’s study elaborate how people who have significant mobility/physical impairments *and* who are accustomed to using computers experience the internet:

For the individual, the bodiless presence on the internet has many advantages. Why waste energy trying to convince your banking establishment to rebuild its entrance, when internet banking is so much easier? Why risk the danger of being dragged up the stairs to the local pub when it is so much easier to go to an online forum for company, where you do not have to worry about physical safety, accessible restrooms or deal with the attitudes of others? This ease and convenience, however, can easily lead to self-imposed restrictions, where what is experienced as choice becomes a restraint instead. The choice is very understandable on the individual level, but for the political endeavours of disabled people as a group, the picture becomes somewhat more complicated. The invisibility of the body can undermine the understanding of how disability is created in society, and be used

against the community of disabled people. Why should a university adapt its buildings when most classes are available as online and distance studies?

There was a sense that the world was moving in their direction, with increasingly more societal functions being moved to the internet. An online identity is becoming a more 'normal' one for all. If everybody else finds their information or does their banking over the internet, *being there* is the most important. [[26]]

This exemplar not only illustrates the influence of design and technology on human individuals and groups/mankind as a whole but also pinpoints some reflections with special significance for the human sector. If a successful innovation system is to be achieved in the human sector, it should be based on how people live and act rather than how machines function. A methodology can be initiated that deals not so much with 'running faster' but with 'running differently' and with a clear sense of purpose.[14]

### **Design science in relation to other sciences**

Our intention here is not to elaborate this relationship generally but restrict ourselves to perspectives from the field of disabilities and the natural sciences. By doing so we hope to add new dimensions to the ethical discourse.

Human needs, wishes and dreams are the starting points for design research in rehabilitation engineering. The design of technical solutions represents in itself an interpretation of problems in a language of its own, different from the word-based analyses of observations, interviews, questionnaires and the like.

A design process in a disability context has to start with the person, end with the person and interact with her throughout the process if the results are to have any success. The situated is a necessary but not sufficient condition. It is a matter of understanding the action in its context and having previous scientific knowledge and considerable, solid experience in order to see the structures and possibilities and from that, propose solutions. The solutions that grow out of the situated processes represent in themselves an interpretation of the actual problem and illuminate them in an implemented form and in their own 'languages', based less on words and interpretation and more on that we humans, in action, can show one another what we mean. This was already pinpointed and analysed by Vygotsky in the 1930s.[27] Paul Dourish discerns similar perspectives from a phenomenological interactive design perspective.[28]

### **Exemplar 3: Pictures as a language**

Sometimes virtual reality can be experienced as more real than actual reality. This can only be revealed through artefacts. For some people with autism, communication with other people isn't sufficient, not even that which includes pointing at the real object. It may require a detour by means of artefacts so that the concrete can be made real for the person involved. During an outing in the woods, a special education teacher placed her hand on a stone at the same time as she asked a pupil with autism to sit on it. The pupil did not seem to understand at all what she meant. She then took a photo of the stone with a digital camera and showed the display screen to the pupil while at the same time asking him to sit down on the stone. He did so immediately.[29]

### *Case studies compared to statistically based studies*

Case studies should not be considered merely pathfinders for later statistically based studies.[30] They have significant advantages that cannot be found in statistical studies and vice versa. The field of rehabilitation engineering and design is based largely on case studies. This is not only because of the difficulties in finding enough subjects in the same 'category'; it is also (mainly) connected to the situated: it is the human being in her environment together with those around her that is the focal point. To pretend that one's own everyday environment can be replaced by a laboratory environment without considerably influencing usability tests is not only naïve but unethical in its approach.

### **Exemplar 4:**

When designing a friendly restroom for elderly or disabled persons, interactions with the future users play an important role. To replace authentic users with young people loaded with weights and knee-joint movement restrictors reveals a misunderstanding of the situation as well as an absence of respect. Our experience tells us that research persons from the actual groups are happy to commit their time, share experiences and take part in testing. But it is pointless not to take into account outside influencing factors such as how much sleep the person got the night before, time of the day, season, increased or decreased weight, temperature, etc. Average percentages in usability tests that disregard the influences of these factors are misleading and of much less importance than relevant situated descriptions of individual cases and processes out of which later important patterns of needs and wishes can be detected.

Most often, the design of doors, locks, alarms, toilet seats, lighting, etc. are carried out separately. For the target groups, the margins are so small that a failure in one can result in a failure of all that follows – it is the entire chain of artefacts and the complete process that ought to be tested. The key question is whether the research person is satisfied with the situation and can carry out the desired activity without too great an effort even if one of the tasks negatively affects what follows.

### *Design and action research versus phenomenology and grounded theory*

In rehabilitation engineering and design, the researcher is supposed to lean forward rather than lean backward, to be a practitioner but a reflective one.[31] Although seldom mentioned or brought up to a conscious level, technology and design involve action research. Action research is sometimes considered questionable in social sciences. There is a fear that the researcher might be involved to such a degree that he or she is no longer 'objective', and that the situation is so biased that it can no longer be scientifically studied. However, *not* being an action researcher in rehabilitation engineering and design, *not* aiming to improve situations, solve problems, strengthen capabilities, enable functioning – at least in the long run – is unethical in the context discussed here.

The quality criteria of design in a disability context are linked to interaction with the user, through cultural probes, sketches, mock-ups, prototypes, material or immaterial artefacts; and observing and intervening in actual usage. It is possible to use emerging technology early in the design phase to reveal new knowledge about the user. Of course, a process of this kind influences the persons involved, but that is not to be considered a drawback. On the contrary, it is a built-in part of the process and a cornerstone of the research. It is part of the aim of the iterative design process. Including the user with the designer and researcher in the design process is 'a goal, not a foul.'

Let's take a look at two of the fundamental concepts in phenomenology: *phenomenon* and *lifeworld*.

Phenomenon in this context does not stand for the occurrence in and of itself, but for the occurrence experienced by someone. The word 'phenomenon' means 'that which shows itself' and it is implicit in the definition that there is someone to whom it is shown. Our focus on the experienced person – the individual with the disability – thus becomes obvious from a phenomenological perspective. It is the phenomenon as it appears to her that we want to call attention to; how she experiences her world and the special conditions that we, if we understand them, can help to improve and enhance with an assistive aid. 'We want to go back to the things themselves,' says Edmund Husserl, phenomenology's founder, in his 1901 publication *Logische Untersuchungen*. [32]

The *lifeworld*, the lived world, is the other indispensable concept and is strongly associated with that of phenomenon. The lifeworld is the world we already find ourselves in, are familiar with and take for granted. It is pre-reflexive and pre-scientific and it both influences us and is influenced by us. We exist in this world with our bodies, which, in the philosophy of the French phenomenologist Maurice Merleau-Ponty, is an integrated whole that he calls 'the lived body'. 'The body is the vehicle of being in the world'. 'The body is the general medium for having a world'. [33]

Phenomenology's desire to allow phenomena, the things that appear, to be the controlling factors, in our opinion is close to Norman's affordance, a concept that surfaced 80 years later. [34] A significant difference is that phenomenology does not just indicate the phenomena, the individual things and how they emerge, but also the lifeworld as the point of departure. Affordance is a concept that originally was used in psychology to describe how objects, people, situations and so forth, offer or afford opportunities for possible interactions to an observer. It is these offerings in the first place that we perceive when we are confronted with phenomena.

The designer in a rehabilitation context has quite a different task than a researcher in a grounded theory context, where the task is mainly to understand what is happening and how the players manage their roles. The researcher gains understanding through observations, conversations and interviews. Data collection, note taking, coding and sorting are all part of the work before writing; categories and theories are supposed to emerge during the process. Grounded theory is distinguished in that it is explicitly emergent and does not test hypotheses. The aim, as Glaser explains, is to discover the theory implicit in the data. [35]

### *Design versus the medical or social model*

Of course, there are many models in disability sciences, but none that is satisfactory for design. *The medical model* oversimplifies disability as an individual characteristic and directs awareness towards individual adjustments and means. *The social model*, on the other hand, directs awareness towards ideological and political analysis, not towards practical everyday solutions for experienced functioning. In 'Making both ends meet', Peter Anderberg introduces what might be the beginning of a relevant model, *FACE*, in which Function is analysed from three different factors: Attitude, Control and Enabling. [36] One of the advantages with the *FACE* model is that it necessitates the consideration of ethical aspects.

### *Design science and natural sciences*

Regardless of theoretical or methodological standpoint, the only research result worthy of the name is new knowledge. Accordingly, in a research project it is seldom the entire process or the project results as such that are the actual research results; the new knowledge generated in the project often constitutes a rather minor portion. But it is essential to identify and define this knowledge and relate it to what already exists. This is quite a delicate task. It helps considerably if the methods involved are standard for the related scientific fields. However, this is not always possible. The phenomenology of Husserl's time as well as grounded theory and to some extent abduction mean that the phenomenon that is the object of investigation can and should be the controlling one.<sup>32</sup> The disadvantages with inventing your own methods are manifest – much is required for the results to be considered credible. At the same time, the advantages are also manifest: it is through them that you achieve proximity to the reality being investigated. The researcher is forced to take more responsibility for the knowledge building than if he or she follows established methods.

Large areas of rehabilitation engineering and design can be dealt with within the framework of epistemology and can thus pride itself on:

- its ability to systematise and accumulate
- its ability to articulate new questions
- its openness and transparency even in its handling of methods and data
- its capacity to generalise on the basis of experience gained
- its openness to other perspectives which may make the results look different

In all these instances, epistemology strives for universality, context-independence and non-relativism. This is advantageous – *provided that it is possible and relevant*. If not, the priority of the particular must apply.<sup>[37]</sup>

### **To sum up**

In rehabilitation engineering and design, there is a need for concrete experiences, acknowledgement of different communities of practice, acceptance of desire as an initiator of change, and an openness for the value of two-way inspiration and information. This all implies an ethics that is dual: operationally situated but with its exemplars continuously questioned and examined in the spirit of international ethical codes, charters and declarations. Induction, deduction, and abduction in between the generalised ethical level and the situated one would vitalise ethics in the design research community. The processes can be strongly facilitated if the confusion and overlaps of design concepts could be replaced by more standardised and agreed-upon core concepts.

Bodil Jönsson is Professor of Rehabilitation Engineering in the Department of Design Sciences at Lund University, Sweden. A physicist and educator, she focuses on the benefits of new technological and educational concepts for people with disabilities. Peter Anderberg, Eva Flodin, Camilla Nordgren and Arne Svensk are doctoral candidates at the same Department with the following research areas respectively: IT, learning and disabilities; spinal muscle atrophy; economic consequences of traumatic spinal injury; design of cognitive assistance. Lone Malmberg is Associate Professor in Arts & Communication at Malmö University, Sweden and the Royal College of Art, London. Her interests include embodied interaction, augmented spaces and artefacts, interaction design and virtual reality environments as well as computer supported collaborative learning and working.

---

[1] Håkan Efring 'The Useworthiness of Robots for People with Physical Disabilities' Doctoral thesis, Lund, Sweden: Certec, LTH, Lund University, 1999. Available at: <http://www.english.certec.lth.se/doc/useworthiness/useworthiness.pdf>

[2] Online Ethics Center for Engineering and Science, Ohio, USA: Case Western Reserve University, 2004. Available at: <http://onlineethics.org/>

[3] Marjo Rauhala and Päivi Topo 'Independent living, technology and ethics' *Technology and Disability* no 15, 2003, pp. 205-214.

[4] *Nuremberg Code* Washington, D.C., USA, 1949-1953. Available at: [www.ushmm.org/research/doctors/Nuremberg\\_Code.htm](http://www.ushmm.org/research/doctors/Nuremberg_Code.htm)



- [5] *Helsinki Declaration* Helsinki, Finland: 18th World Medical Assembly, June 1964, amended 1975, 1983, 1989. Available at: <http://onlineethics.org/reseth/helsinki.html>
- [6] *The European Convention 2003*. Available at: <http://european-convention.eu.int/>
- [7] *The Charter of Fundamental Rights of the European Union* Nice, France, Dec. 2000. Available at: [http://www.europarl.eu.int/charter/default\\_en.htm](http://www.europarl.eu.int/charter/default_en.htm)
- [8] *Convention on the Rights of the Child* UNICEF, 2002. Available at: [www.unicef.org/crc/crc.htm](http://www.unicef.org/crc/crc.htm)
- [9] *Citizens Rights and New Technologies: A European Challenge* Brussels, May, 2000. Available at: [http://europa.eu.int/comm/european\\_group\\_ethics/docs/prodi\\_en.pdf](http://europa.eu.int/comm/european_group_ethics/docs/prodi_en.pdf)
- [10] Bettye R. Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, and Gregg Vanderheiden *The Principles of Universal Design* NC, USA: NC State University, The Center for Universal Design, Version 2.0, 1997. Available at: [http://www.design.ncsu.edu/cud/univ\\_design/principles/udprinciples.htm](http://www.design.ncsu.edu/cud/univ_design/principles/udprinciples.htm)
- [11] Eva Flodin 'Assistenter i min livsvärld (Assistents in my lifeworld)' Praktiskt-Pedagogiska Problem (Practical-Pedagogical Problems) Halmstad, Sweden: Halmstad University, no 12, 2000.
- [12] Eva Flodin 'Jakten på Instinktivspelaren' (Hunt for the Instinctive Player) Master thesis, Halmstad, Sweden: Halmstad University, 2000.
- [13] Edward Tenner *Our Own Devices – The Past and the Future of Body Technology* New York: Random House, 2003.
- [14] Håkan Edeholt *Design Innovation och andra Paradoxer – förändring satt i system (Design, Innovation and other Paradoxes)* Doctoral thesis, Göteborg, Sweden: Chalmers University of Technology, 2004. Available at: <http://webzone.k3.mah.se/k3haed/>
- [15] Jean Lave and Etienne Wenger *Situated Learning: Legitimate Peripheral Participation* New York, USA: Cambridge University Press, 1991.
- [16] Finn Kensing and Andreas Munk-Madsen 'PD: structure in the Toolbox' Communication of the ACM vol 36, issue 6, New York, USA: ACM Press, 1993, pp. 78-85. Available at: <http://doi.acm.org/10.1145/15371.163278>
- [17] William Gaver, Anthony Dunne, and Elena Pacenti 'Design: Cultural Probes' *Interactions* vol 6, no 1, 1999, pp.21-29.
- [18] William Gaver, Anthony Dunne, and Elena Pacenti 'Projected Realities: Conceptual Design for Cultural Effect' Proc. of CHI '99 ACM Press, 1999, pp. 600-608.
- [19] Hilary Hutchinson, Wendy Mackay, Bosse Westerlund, Benjamin Bederson, Allison Druin, Catherine Plaisant, Michel Beaudouin-Lafon, Stéphane Conversy, Helen Evans, Heiko Hansen, Nicolas Roussel, Björn Eiderbäck, Sinna Lindquist, and Yngve Sundblad 'Technology Probes: Inspiring Design for and with Families' in Proc. of CHI '03 ACM Press, 2003, pp. 17-24. Available at: <http://insitu.lri.fr/~roussel/publications/CHI03.pdf>
- [20] Cooperative Systems Engineering Group, Computing Dept., Lancaster University, UK. Available at: <http://www.comp.lancs.ac.uk/computing/research/cseg/index.html>
- [21] Bodil Jönsson, Arne Svensk, David Cuartielles, Lone Malmberg and Pierre Schlaucher *Mobility and learning environments: engaging people in design of their everyday environments* Lund, Sweden: Certec, LTH, Lund University and Malmö University, Creative Environments, 2002. Available online: <http://www.certec.lth.se/doc/mobility1/MobilityLearningReport021215.pdf>
- [22] Sean Donahue 'Discipline Specific Ethics' *Design Philosophy Papers* no 2, 2004.
- [23] Tony Fry 'Design Ethics as Futuring' *Design Philosophy Papers* no 2, 2004.
- [24] Cameron Tonkinwise 'Ethics by Design, or the Ethos of Things' *Design Philosophy Papers*, no 2, 2004.
- [25] Bruno Latour 'Technology is Society Made Durable' in J. Law (ed) *A Sociology of Monsters. Essays on Power, Technology and Domination* (Sociological Review Monograph) New York and London: Routledge, 1991, pp.103-131.
- [26] Peter Anderberg 'Being there' *Disability and Society* vol 20, no 7, 2005, pp. 721-735.
- [27] Lev S. Vygotsky *Mind in Society* Cambridge, MA, USA: Harvard University Press, 1930.
- [28] Paul Dourish *Where the Action Is. The Foundations of Embodied Interaction* Cambridge, MA, USA: MIT Press, 2001.
- [29] Bodil Jönsson 'Enabling communication: pictures as language' in Malcolm MacLachlan and Pamela Gallagher (eds) *Enabling Technologies. Body Image and Body Function* Edinburgh, UK: Churchill Livingstone, 2004, pp. 33-57.
- [30] Vilayanur S. Ramachandran and Sandra Blakeslee *Phantoms in the Brain. Probing the Mysteries of the Human Mind* New York: William Morrow & Company, 1998.
- [31] Donald Schön *The Reflective Practitioner. How Professionals Think in Action* New York: Basic Books, 1983.

[32] Edmund Husserl *Logische Untersuchungen (Logical Investigations) vol II*, 1901, p.7. Available online in German at: <http://www.princeton.edu/~batke/phph/husserl/lu/>

[33] Maurice Merleau-Ponty *Phenomenology of Perception* New York and London: Routledge, 1962, pp. 82 and 146.

[34] Donald Norman *The Psychology of Everyday Things* New York: Basic Books, 1988.

[35] Barney G. Glaser 'Naturalist Inquiry and Grounded Theory' *Forum: Qualitative Social Research* Jan., 2004. On-line Journal, vol 5, no 1, art 7. Available at: <http://www.qualitative-research.net/fqs-texte/1-04/1-04glaser-e.htm>

[36] Peter Anderberg 'Making both ends meet' *Disability Studies Quarterly* vol 25, no 3, 2005.

[37] Martha Nussbaum *Love's Knowledge. Essays on Philosophy and Literature* Oxford, UK: Oxford University Press, 1990.

III





Submitted to European Journal of Epidemiology

On the need of validating inpatient databases

Camilla Nordgren, BSc<sup>1,2,3</sup>

<sup>1</sup>Certec, Division of Rehabilitation Engineering Research, Department of Design Sciences, Lund University, <sup>2</sup>Neurotec Department and <sup>3</sup>Spinalis SCI Research Unit, Karolinska Institutet, Stockholm, Sweden

Correspondence to:  
Camilla Nordgren, BSc  
Certec, Box 118  
S-221 00 Lund  
Phone: +46 46 222 05 17  
Fax: +46 46 222 44 31  
E-mail: [camilla.nordgren@certec.lth.se](mailto:camilla.nordgren@certec.lth.se)

**Abstract**

Health care utilisation is often analysed retrospectively in epidemiologic and health services research, aiming to yield a better evidence basis for the future. The validity of the vast amount of health care information collected in administrative databases cannot be taken for granted; validation has so far been neglected. This study reports a validation process of an inpatient database held by the Swedish National Board of Health and Welfare. This nationwide Hospital Discharge Register contains data from the early 1960s. An accurate diagnosis prevalence group (n=495) was acquired from the Swedish Spinalis Clinic. Their inpatient information was retrieved from the Hospital Discharge Register. Three main questions were raised to check the validity of the database and evaluate the amount of systematic error: Is an inpatient stay associated with the injury date? Is the reported first hospitalisation episode plausible given the level and extent of injury? Are all anticipated care and/or rehabilitation providers represented in the material? For 62% the first reported hospitalisation date correlated with the injury date. For the other 38%, hospitalisation was reported to start between 2 and 8651 days after injury. Considering the level and extent of injury, individuals were reported to have unrealistically short initial hospitalisation. The prevalence group visited 42 different hospitals and 47 clinics. Five rehabilitation clinics, though, were not reported. This study reveals comprehensive systematic errors resulting in an underestimation of inpatient care utilisation on incidence and prevalence levels. Extensive knowledge of the diagnosis group has been a necessity for examining and evaluating the data. Researchers using administrative databases should always validate their data to reveal possible systematic errors.

**Key words:** Administrative database, Hospitalisation, Inpatient care, LOS, Traumatic spinal cord injury, Validation process

**Abbreviations**

ASIA	American Spinal Injury Association
DRG	Diagnosis Related Group
HDR	Hospital Discharge Register
LOS	Length of stay
SCI	Spinal cord injury

## Introduction

Describing and analysing people's utilisation of health care is indispensable for prognosticating future care utilisation and for conducting economic evaluations, epidemiologic studies, and clinical trials. In order to develop effective treatment programmes, understanding the nature and extent of health service utilisation is essential. Principally, there are three different ways to collect data: patient supplied, medical records or administrative databases. Several studies have been conducted evaluating the accuracy of the patient surveying method, e.g. [1, 2]. Both over- and under-reporting of hospitalisation episodes have been detected. Horwitz et al. [3] assessed the reliability of epidemiologic data from medical records and proposed strategies for improving the basic quality. Utilising administrative databases or secondary data involves analysis after collection without a specific research purpose and interference by the researcher [4].

In recent years, data retrieval has been facilitated by the vast amount of health care information collected and stored in databases and registers. Advantages of using these secondary sources are substantial time and cost savings, the size of the sample, the representativeness and the reduced likelihood of bias due to non-response [4]. Despite these advantages, this method has possible shortcomings that must be dealt with. Structural weaknesses and biases due to incomplete and inconsistent reporting and coding are mentioned. Furthermore, completeness, accuracy, validity and reliability are critical issues [5].

A common problem for many epidemiology researchers is whether the diagnosis code in question detects all true cases in these databases [6, 7]. Blomqvist [5] discusses three methodological approaches for assessing the completeness of registration of cases. The first is to compare the data source with several other independent data sources, the second is review of medical records and the third builds on a comparison between total numbers of cases in different sources. De Vet et al. [8] provide a theoretical background for performing and reading systematic reviews of diagnostic studies by discussing methodological quality in terms of internal and external validity. Rosen [9] argues that validation has been studied and reported. However, determining true cases is not enough. In analyses examining health care utilisation, e.g. cost-of-illness studies, the data must also be validated. Without such validation, the support for study results is poor and the prediction for future health care vague. This fact, however, is generally neglected and studies seem to lack descriptions of the validation process and its application to the data included.

In an international evaluation of Swedish public health research, it was concluded that Sweden is one of the world leaders in public health research including epidemiology and register-based research [10]. The use of the Hospital Discharge Register (HDR) has resulted in numerous research articles in different fields, e.g. [11-13].

This paper examines the inpatient care utilisation registered in the Swedish HDR [14] in an accurate diagnosis group: traumatic spinal cord injury (SCI). Whilst diagnosis detection is a problem for many researchers, this study has the advantage of having access to a population-based cohort of individuals with traumatic SCI.

## Methods

### *Data sources*

*Spinalis* is a comprehensive regional SCI outpatient clinic in the greater Stockholm area and the island of Gotland, comprising about 1.9 million inhabitants. A health care database was established in the beginning of the 1990s from a survey of regional registers and after individual patient contacts by the *Spinalis* rehab team. The dropout rate was 6.9% [15]. This procedure assured the accuracy of the database as an SCI health care database. *Spinalis* is a part of the established referral procedure, which insures further incidence inclusion in the database. In June 1999, the author submitted a retrieval request to this database with the inclusion criteria of living patients with traumatic spinal cord injury. The present study is based on the 495 persons who met these requirements. Data about birth dates, gender, injury date, level and extent of injury (ASIA) [16] and cause of injury were collected for each individual. In order to detect false positive and false negative cases, registers of individuals with other spinal cord injuries were investigated. These person's medical records were inspected for unreliable facts.

The HDR is complete in the investigated region from 1972. All cases with an earlier injury date were thus excluded (n=58). By checking the Swedish national registration office it was found that one person had died before June 1999 and was consequently excluded from this study. Ten persons were in inpatient care on the actual injury date or in direct connection with to it. Five of these were being treated for other reasons and in the meantime sustained a traumatic SCI. Another two persons did not have a traumatic SCI and were excluded. Three persons' injury dates were inaccurate and were corrected. The list of cases and their diagnosis was verified by a physician. This led to the exclusion of an additional four individuals who did not have a traumatic spinal cord injury. One person had an incorrect personal identity number and was therefore not included in the HDR investigation. One individual registered in the non-traumatic list was included after it was found that this person had a traumatic injury. This resulted in a prevalence group of *430 traumatic spinal cord injury cases (out of the originated 495)*.

*The Hospital Discharge Register:* Statistics of diseases and surgical treatments of patients have a long history in Sweden. In the 1960s, the National Board of Health and Welfare started to collect data on individual patients who had been treated as inpatients at public hospitals. The county of Stockholm has since 1972 reported all inpatient care to the HDR [14]. There are different types of information in the register: data on the patient and hospital, administrative data such as date of admission and discharge, and medical data with diagnosis and surgical procedures. For all records reported to the HDR, data and quality controls are carried out.

The unique personal identity number assigned to each Swedish resident was used to obtain data from the HDR. Information about each person's registration regarding hospital/institution, clinic, unit, date of admission and discharge, type of visit, diagnosis, code and date for surgical operation and code for diagnosis related groups (DRG) were collected. Data was examined from 1972 through 2002.

### *Validation process*

Validity is defined as whether the variables actually measure what was intended to be measured. The HDR consists of numerous individual pieces of information. Validating an extensive database thus requires investigations on an individual level. Understanding each person's incentive and condition for utilising inpatient care requires knowledge about individual characteristics such as birth and death facts, residential registration, gender, injury date, level and extent of injury (ASIA), and cause of injury. Expectations were formulated as questions regarding what was to be found in the HDR. The first question put to the data was: Is an inpatient stay associated with the injury date? The second question was: Is the reported first hospitalisation episode (length of stay – LOS) plausible given the level and extent of injury? An episode is defined as the period from admission until discharge to something that does not lead to a registration in the HDR (i.e. being treated as an inpatient at a public hospital/institution). The third question was: Are all the anticipated care and/or rehabilitation providers represented in the material?

### *Ethics*

This study was approved by the Ethics Committee of Karolinska Institutet in Stockholm, Sweden.

## Results

### *Is an inpatient stay associated with the injury date?*

For 22 individuals, day and/or month of injury was not specified in their medical records. For those individuals lacking an injury day, the first day in the month was calculated as the injury day. For those lacking an injury month and day, the first of January was specified as the injury day and month.

Table 1. Number of days between injury date and first registered inpatient stay
---

Table 1 shows the number of days between injury date and the first registered inpatient stay. Seventeen persons did not have any inpatient care at all reported after the injury date (three had registered inpatient care before the injury date; fourteen did not). Sixteen individuals actually had an inpatient stay registered the day before the actual injury. About 62% of the group had an inpatient stay reported in direct connection with the injury date (-1, 0, 1 days), i.e. 38% had their first stay 2 days or more after the injury date.

### *Is the reported first hospitalisation episode plausible given the level and extent of injury?*

The number of inpatient days was checked for the individuals with a first hospitalisation stay in direct conjunction with the injury date. Included were those with a reported inpatient stay of -1, 0 and 1 day in relation to the injury date (n 257). Table 2 shows the distribution according to level and extent of injury and gives information of LOS for the initial hospitalisation.

Table 2. Length of stay in the first hospitalisation episode after injury date distributed according to level and extent of injury
--

It was noticed that an initial LOS for some individuals seemed to be interrupted by a holiday such as Christmas or New Year. For 20 individuals this was indeed the case. These inpatient stays had an interruption that lasted between 3-31 days, and by including these individuals' inpatient care after the interruption, the total stay was thus prolonged by 2-171 days.

### *Are all the anticipated care and/or rehabilitation providers represented in the material?*

The inpatient stay prevalence group (n=413) had utilised care at 42 different hospitals/institutions in the Stockholm area, and 47 different clinics from injury date through 2002.



## Discussion

This paper examines the validity of the content in an inpatient database. The use of a verified population-based health care database including additional controls ensures the validity of the diagnosis group investigated and the validity process can thus focus on the inpatient data. Considerable knowledge of the diagnosis and its effect in terms of health care utilisation proved to be a prerequisite when putting questions to the HDR. Interpreting data and estimating the validity was absolutely necessary for finding under-reporting and lack of reporting.

Extensive investigations were made regarding the patients included in the health care database, e.g. if and when a person had died and his/her residential registration were verified. Odd inpatient entries such as being admitted to inpatient stay and sustaining a traumatic SCI during that time were also examined.

*Is an inpatient stay associated with the injury date?*

A traumatic spinal cord injury is an acute and serious condition where immediate care is necessary. The alternative of not seeking care or waiting a couple of days occurs, if ever, in exceptional cases. Some studies analysing LOS, separate acute care hospitalisation from rehabilitation hospitalisation and stipulate a time limit from the injury date as an inclusion criterion [17-20]. Others calculate the LOS from the day of injury [21], include individuals admitted for their initial episode [22] or use date of the index hospitalisation as the date of the SCI [23]. All these studies lack further analysis regarding possible divergence between the onset of traumatic SCI and admission day. Putzke et al. [24] and Fine et al. [25], on the other hand, include individuals admitted on the first day of injury. In the present study more than one third of the prevalence group did not have an initial inpatient registration (-1, 0, +1 day) in conjunction with the injury date. The time lapse between injury date and first inpatient stay should be interpreted as possible days spent in inpatient care.

The prevalence population examined includes persons who have moved to the investigated region and who have a traumatic SCI sustained earlier. This group includes immigrants and residents moving from other parts of the country. The health care system in Sweden allows people to seek health care anywhere in the country. It is most common, however, to utilise the health care system in one's own county. Since the patient data originated from one region, utilisation of care in other parts of the country was not included. In 2002, controls carried out at the Swedish national registration office resulted in finding 31 persons who were registered in a region other than Stockholm. Not being a resident of Stockholm in 2002 does not, however, say anything about place of registration at the time of injury. If a person had moved out of the area and then moved back into the area before April 2002, these movements could not be traced. One explanation for the high figure of divergence besides immigrants could be individuals injured during a temporary stay abroad or in another region in the country. These individuals are typically moved to their resident hospitals after the first trauma period and so, their initial hospitalisation would not have been recorded in the investigated database.

*Is the reported first hospitalisation episode plausible given the level and extent of injury?*

Quite a few studies examine factors impacting LOS: changes in management [26], severity of injury [22, 27, 28], respiratory complications [29], the incidence of pressure ulcers and

neurologic improvement [30], occurrence of anaemia or hypoalbuminaemia [27], timing of spinal stabilisation [31], age at injury, sex, neurological level of lesion, Frankel grade, medical complications, associated injuries and surgical procedures [25], age at injury only [17, 20, 32], gunshot versus nongunshot SCI [24], decade of admission [33] and gender only [34]. All these investigated variables show different results. This study describes initial LOS according to extent of and neurological level. Table 2 presents a LOS range from 2-653 days, with a mean of 126 and median of 108 days.

Comparing results from other investigations is a way of determining whether the reported inpatient figures are plausible. A literature review on traumatic spinal cord injury and initial LOS shows a great variety in the number of days spent in hospital/rehabilitation with figures ranging from 1 up to 4742 days (Table 3). These studies all have different inclusion criteria, terms of description and grouping when it comes to etiology, age, injury year, level and extent of injury and type of care. This impedes comparison. No discussion has been found in any of the published studies about how realistic it is to have very few or many inpatient days registered. SCI patients at high risk of extended lengths of stay, referred to as outliers, are defined in a study of Burnett et al. [35] as patients whose lengths of stay exceed the mean length of stay by more than two standard deviations, while Cifu et al. [17] use four standard deviations. These studies discuss the outliers in terms of long LOS, but it should also be of considerable interest to focus on outliers in the other direction, in terms of short LOS.

Table 3 Literature review on initial length of stay
---

The present findings do not differentiate type of care: acute vs. rehabilitation. The data represent days of inpatient stay irrespective of type, in a public hospital. As seen in Table 3, some researchers do not examine the acute LOS. Several studies [18-20, 34] spring from persons discharged from the Model System with an enrol system of patients being admitted within 60 days of injury. In some studies, 86-93% of all patients are admitted to the investigated clinics within 21 days of injury. It is thereby uncertain how much inpatient time the patients have consumed before the rehabilitation LOS. It can therefore be interpreted that the LOS could in some cases actually be prolonged by as much as 60 days. A lack of differentiation between the acute and rehabilitation organisation could perhaps explain some of the differences and the great range of LOS.

Having a complete (ASIA A) cervical injury and utilising only 2, 7 or 22 inpatient days seems unrealistic. Revealing the likelihood of having an extremely short or long initial inpatient stay requires further investigation through other sources of data. Knowledge about medical care organisations in your country, rehabilitation regime and, of course, the investigated diagnosis are of value when determining which cases need more examination.

*Are all the anticipated care and/or rehabilitation providers represented in the material?*

The HDR administrated by the Swedish National Board of Health and Welfare contains inpatient data from public hospitals. Surprisingly, at least five institutions/rehabilitation units (Stora Sköndal, Stiftelsen Humlegården, Frösunda Center/Stockholm Rehab Station, Mälargården and Röda Korset) were not represented at all in the database. These institutions are typically foundations or privately owned. One of these, Frösunda Center/Stockholm Rehab Station, is included in the established referral procedure of rehabilitation and a great

majority of all incidence patients stay at this rehabilitation unit for a while. Normally, the county council purchases care and rehabilitation services from these providers. Analysing the consequences of not including these rehabilitation units requires great effort since no computerised data on an individual level is accessible.

To investigate inpatient care in an administrative database presupposes that the disease in an individual has been reported and recorded in the system. Blomqvist [5] points out three factors that influence this: the care-seeking behaviour of the person, the supply of health care, and the physician's propensity to admit patients. The nature of an SCI does not leave a person in doubt whether to seek care or not. Nor can the health care organisation in Sweden be seen as a hindrance to inclusion in the information system.

Low validity may imply systematic error. This occurred for two of the investigated factors in this study:

- Systematic exclusion of initial inpatient utilisation for individuals possibly not injured in the region
- Systematic exclusion of 'not public' hospitals/rehabilitation institutions

Systematic errors are not easy to discover and the chance of discerning them does not correlate with the size of the sample. When found, it is possible to compensate for them. The occurrence of non-systematic errors in this material could be due to errors in reported dates which were not detected by the validation process performed. Further investigations of each individual's medical records must be carried out in order to detect them.

In conclusion, the HDR is a valuable source when conducting epidemiologic and health services research. However, using the HDR without any validation process could, as detected in the investigated diagnosis group, lead to a severe underestimation of the LOS in the region, both on incidence and prevalence levels. Quantifying the figures of this underestimation shows that almost 40% of the patients did not have an inpatient care episode in close connection to the injury date. Unrealistic figures regarding initial LOS were also found. Efforts made to judge the extent of these unrealistic figures by comparing reported LOS in different countries were complicated. This was due to different health care organisations and study inclusion criteria. At least 5 rehabilitation clinics were not represented in the material. This study reveals comprehensive systematic errors. Extensive knowledge of the investigated diagnosis group has been a necessity for examining and evaluating the data. Researchers using administrative databases like this one must always validate their data to attain reliable results.

**Acknowledgements**

This study was made possible by the kind assistance of the Spinalis unit. The author would also like to thank Lars Werhagen, M.D. and Peter Kitzing, M.D., Ph.D. for valuable help. The financial support for this research, provided by Stiftelsen för bistånd åt rörelsehindrade i Skåne, is greatly appreciated.

## References

1. Kennedy ADM, Leigh-Brown AP, Torgerson DJ, Campbell J, Grant A. Resource use data by patient report or hospital records: Do they agree? *BMC Health Serv Res* 2002; 2:2.
2. Tsui ELH, Leung GM, Woo PPS, Choi S, Lo SV. Under-reporting of inpatient services utilisation in household surveys - a population-based study in Hong Kong. *BMC Health Serv Res* 2005; 5:31.
3. Horwitz RI, Yu EC. Assessing the reliability of epidemiologic data obtained from medical records. *J Chron Dis* 1984; 37(11):825-831.
4. Sorensen HT, Sabroe S, Olsen J. A framework for evaluation of secondary data sources for epidemiological research. *Int J Epidemiol* 1996; 25(2):435-442.
5. Blomqvist P. On the use of administrative databases in health care analyses [Dissertation]. Stockholm, Sweden: Karolinska Institutet, 1998.
6. Augutis M, Malzer H, Levi R. Pediatric spinal cord injury in Sweden; how to identify a cohort of rare events. *Spinal Cord* 2003; 41(6):337-346.
7. Mccarty DJ, Tull ES, Moy CS, Kwok CK, Laporte RE. Ascertainment corrected rates: Applications of capture-recapture methods. *Int J Epidemiol* 1993; 22(3):559-565.
8. De Vet HCW, van der Weijden T, Muris JWM, Heyrman J, Buntinx F, Knottnerus JA. Systematic reviews of diagnostic research. Considerations about assessment and incorporation of methodological quality. *Eur J Epidemiol* 2001; 17(4):301-306.
9. Rosen M. National health data registers: a Nordic heritage to public health. *Scand J Public Health* 2002; 30(2):81-85.
10. Kamper-Jorgensen F, Arber S, Berkman L, Mackenbach J, Rosenstock L, Teperi J. Part 3: International evaluation of Swedish public health research. *Scand J Public Health* 2005; 33:46-84.
11. Ericson A, Nygren KG, Olausson PO, Kallen B. Hospital care utilization of infants born after IVF. *Hum Reprod* 2002; 17(4):929-932.
12. Hemmingsson T, Weitoft GR. Alcohol-related hospital utilization and mortality in different occupations in Sweden in 1991-1995. *Scand J Work Environ Health* 2001; 27(6):412-419.
13. Weitoft GR, Haglund B, Hjern A, Rosen M. Mortality, severe morbidity and injury among long-term lone mothers in Sweden. *Int J Epidemiol* 2002; 31(3):573-580.
14. The Swedish Hospital Discharge Register, <http://www.sos.se/epc/english/ParEng.htm>. 2006, 1-2-2006
15. Levi R, Hultling C, Nash MS, Seiger A. The Stockholm spinal cord injury study: 1. Medical problems in a regional SCI population. *Paraplegia* 1995; 33(6):308-315.

16. Ditunno JF, Young W, Donovan WH, Creasey G. The international standards booklet for neurological and functional classification of spinal cord injury. *Paraplegia* 1994; 32(2):70-80.
17. Cifu DX, Seel RT, Kreutzer JS, McKinley WO. A multicenter investigation of age-related differences in lengths of stay, hospitalization charges, and outcomes for a matched tetraplegia sample. *Arch Phys Med Rehabil* 1999; 80(7):733-740.
18. Eastwood EA, Hagglund KJ, Ragnarsson KT, Gordon WA, Marino RJ. Medical rehabilitation length of stay and outcomes for persons with traumatic spinal cord injury - 1990-1997. *Arch Phys Med Rehabil* 1999; 80(11):1457-1463.
19. McKinley WO, Seel RT, Gadi RK, Tewksbury MA. Nontraumatic vs.traumatic spinal cord injury: A rehabilitation outcome comparison. *Am J Phys Med Rehabil* 2001; 80(9):693-699.
20. Seel RT, Huang ME, Cifu DX, Kolakowsky-Hayner SA, McKinley WO. Age-related differences in length of stays, hospitalization costs, and outcomes for an injury-matched sample of adults with paraplegia. *J Spinal Cord Med* 2001; 24:241-250.
21. Webb SB, Berzins E, Wingardner TS, Lorenzi ME. Spinal cord injury: Epidemiologic implications, costs and patterns of care in 85 patients. *Arch Phys Med Rehabil* 1979; 60(8):335-340.
22. Tooth L, McKenna K, Geraghty T. Rehabilitation outcomes in traumatic spinal cord injury in Australia: functional status, length of stay and discharge setting. *Spinal Cord* 2003; 41(4):220-230.
23. Dryden DM, Saunders LD, Rowe BH, May LA, Yiannakoulias N, Svenson LW et al. Utilization of health services following spinal cord injury: a 6-year follow-up study. *Spinal Cord* 2004; 42(9):513-525.
24. Putzke JD, Richards JS, Devivo MJ. Gunshot versus nongunshot spinal cord injury - Acute care and rehabilitation outcomes. *Am J Phys Med Rehabil* 2001; 80(5):366-370.
25. Fine PR, Stover SL, Devivo MJ. A methodology for predicting lengths of stay for spinal cord injury patients. *Inquiry* 1987; 24(2):147-156.
26. Tator CH, Duncan EG, Edmonds VE, Lapczak LI, Andrews DF. Neurological recovery, mortality and length of stay after acute spinal cord injury associated with changes in management. *Paraplegia* 1995; 33(5):254-262.
27. Burr RG, Cliftpeace L, Nuseibeh I. Haemoglobin and Albumin as predictors of length of stay of spinal injured patients in a rehabilitation center. *Paraplegia* 1993; 31(7):473-478.
28. Tator CH, Duncan EG, Edmonds VE, Lapczak LI, Andrews DF. Complications and costs of management of acute spinal cord injury. *Paraplegia* 1993; 31(11):700-714.
29. Winslow C, Bode RK, Felton D, Chen D, Meyer PR. Impact of respiratory complications on length of stay and hospital costs in acute cervical spine injury. *Chest* 2002; 121(5):1548-1554.

30. Celani MG, Spizzichino L, Ricci S, Zampolini M, Franceschini M. Spinal cord injury in Italy: A multicenter retrospective study. *Arch Phys Med Rehabil* 2001; 82(5):589-596.
31. Campagnolo DI, Esquieres RE, Kopacz KJ. Effect of timing of stabilization on length of stay and medical complications following spinal cord injury. *J Spinal Cord Med* 1997; 20(3):331-334.
32. Cifu DX, Huang ME, Kolakowsky-Hayner SA, Seel RT. Age, outcome, and rehabilitation costs after paraplegia caused by traumatic injury of the thoracic spinal cord, conus medullaris, and cauda equina. *J Neurotrauma* 1999; 16(9):805-815.
33. Ronen J, Itzkovich M, Bluvshtein V, Thaleisnik M, Goldin D, Gelernter I et al. Length of stay in hospital following spinal cord lesions in Israel. *Spinal Cord* 2004; 42(6):353-358.
34. Greenwald BD, Seel RT, Cifu DX, Shah AN. Gender-related differences in acute rehabilitation lengths of stay, charges, and functional outcomes for a matched sample with spinal cord injury: A multicenter investigation. *Arch Phys Med Rehabil* 2001; 82(9):1181-1187.
35. Burnett DM, Kolakowsky-Hayner SA, Gourley EV, Cifu DX. Spinal cord injury "outliers": An analysis of etiology, outcomes, and length of stay. *J Neurotrauma* 2000; 17(9):765-772.
36. Post MWM, Dallmeijer AJ, Angenot ELD, van Asbeck FWA, van der Woude LHV. Duration and functional outcome of spinal cord injury rehabilitation in the Netherlands. *J Rehabil Res Dev* 2005; 42(3):75-85.
37. Samsa GP, Landsman PB, Hamilton B. Inpatient hospital utilization among veterans with traumatic spinal cord injury. *Arch Phys Med Rehabil* 1996; 77(10):1037-1043.
38. Bravo P, Labarta C, Alcaraz MA, Mendoza J, Verdu A. Outcome after vertebral fractures with neurological lesion treated either surgically or conservatively in Spain. *Paraplegia* 1993; 31(6):358-366.
39. Cifu DX, Seel RT, Kreutzer JS, Marwitz J, McKinley WO, Wisor D. Age, outcome, and rehabilitation costs after tetraplegia spinal cord injury. *Neurorehabilitation* 1999; 12(3):177-185.
40. Biering-Sorensen F, Pedersen V, Clausen S. Epidemiology of spinal cord lesions in Denmark. *Paraplegia* 1990; 28(2):105-118.

**Table 1.** Number of days between injury date and first registered inpatient stay

Number of days between injury date and first inpatient stay	Number of persons (N=413)
-1, 0 or 1	257
2-10	46
11-100	44
101-1000	22
1001-10000	44



**Table 2.** Length of stay in the first hospitalisation episode after injury date distributed according to level and extent of injury

Neurological level of lesion	ASIA A <sup>a</sup> (Complete)	
	n	LOS
Cervical	29	2,7,22,95,104,135,138,142,144,155,160,171,173,179,181,189,199,205,208,209,217,227,229,239,251,254,316,321,653
Thoracic	36	82,89,103,104,106,108,108,111,113,115,121,125,128,132,135,137,141,143,143,149,149,151,154,164,168,168,189,193, 202,202,204,220,227,231,329,518
Lumbar	3	46,127,215
Sacral	2	62,217

---

Neurological level of lesion	ASIA B-D <sup>a</sup> (Incomplete)	
	n	LOS
Cervical	86	10,15,17,19,28,30,30,30,30,31,32,34,34,35,42,43,43,45,55,58,60,61,65,66,67,67,67,70,73,74,74,75,76,81,82,82,83,85,87,92,93,96,100,103,105,106,115,115,115,116,118,120,123,123,124,130,132,136,136,137,142,150,152,153,153,154,157,159,162,167,167,170,174,177,198,198,209,219,221,244,251,273,277,293,365,637
Thoracic	33	16,22,29,35,36,39,49,53,54,59,75,83,92,102,109,115,116,123,128,130,134,136,144,158,164,166,176,180,187,228,234,393,447
Lumbar	40	7,8,9,16,18,19,28,32,39,41,51,55,66,70,78,88,90,94,96,96,97,97,102,104,105,111,135,146,164,173,183,201,225,232,232,232,239,381,412,477
Sacral	2	19,111

---

ASIA E <sup>b</sup>		
	n	LOS
	23	2,5,9,12,14,17,19,19,24,34,34,35,36,40,55,57,58,59,68,77,83,103,124
Neurological ASIA no information		
level of lesion		
	n	LOS
Cervical	0	
Thoracic	1	290
Lumbar	1	381
Sacral	0	
No information	1	60

<sup>a</sup>American Spinal Injury Association (ASIA) [16]: <sup>b</sup> No residual sensorimotor deficit that makes it possible to identify the original lesion

**Table 3.** Literature review on initial length of stay

<b>Author</b> <b>Variables Investigated</b>	<b>Post et al. [36]</b>	<b>Eastwood et al. [18]</b>	<b>Samsa et al. [37]</b>	<b>Tooth et al. [22]</b>	<b>Cifu et al. [17]</b>
<b>Year of investigation</b>	2000-2003	1997	1970-1986	1993-1998	1988-1996
<b>Number of patients</b>	118	373	1250	167	375
<b>Injury level</b>	Tetraplegia, Paraplegia	Tetraplegia, Paraplegia	Quadriplegia, Paraplegia		C8 or higher
<b>Injury extent</b> ASIA Frankel	A, B, C, D	Incomplete, Complete	Incomplete, Complete	A, B, C, D, E	A, B, C, D
<b>LOS Acute</b> Mean		20			17.1 <sup>e</sup> , 20.8 <sup>f</sup> , 18.8 <sup>g</sup>

±SD					±18.8 <sup>e</sup> , ±16.4 <sup>f</sup> , ±17.23 <sup>g</sup>
Median					
Range					
<b>LOS</b>					
<b>Rehabilitation</b>					
Mean	274.8	60.8	300 <sup>a</sup> , 255 <sup>b</sup> , 218 <sup>c</sup> , 219 <sup>d</sup>		70.8 <sup>e</sup> , 71.9 <sup>f</sup> , 72.4 <sup>g</sup>
±SD	±150.0	±38.7	±183 <sup>a</sup> , ±222 <sup>b</sup> , ±244 <sup>c</sup> , ±119 <sup>d</sup>		±53.4 <sup>e</sup> , ±44.2 <sup>f</sup> , ±49.3 <sup>g</sup>
Median	243		263 <sup>a</sup> , 223 <sup>b</sup> , 182 <sup>c</sup> , 200 <sup>d</sup>	206 <sup>a</sup> , 64.5 <sup>b</sup> , 96.5 <sup>c</sup> , 43.0 <sup>d</sup>	
Range			1-1644 <sup>a</sup> , 1-2187 <sup>b</sup> , 2-4742 <sup>c</sup> , 3-692 <sup>d</sup>		

<sup>a</sup>Tetraplegia, Frankel A, <sup>b</sup>Tetraplegia, Frankel B-E, <sup>c</sup>Paraplegia, Frankel A, <sup>d</sup>Paraplegia, Frankel B-E, <sup>e</sup>Age 18-34, <sup>f</sup>Age 35-64, <sup>g</sup>Age 65+

<b>Author</b>	<b>Seel et al. [20]</b>	<b>Cifu et al. [32]</b>	<b>Greenwald et al. [34]</b>	<b>Ronen et al. [33]</b>	<b>Bravo et al. [38]</b>	<b>McKinley et al. [19]</b>
<b>Variables Investigated</b>						
<b>Year of investigation</b>	1988-1998	1988-1996	1988-1998	1962-1992	1989-1991	1992-1999
<b>Number of patients</b>	180	2169	1074	250	123	87
<b>Injury level</b>	T1-L5	T1-L5	C1-L5	Cervical, Thoracic, Lumbosacral	T1-T4 excluded	C1-L5
<b>Injury extent</b>						
ASIA	A, B, C, D	A, B, C, D	A, B, C, D			A, B, C, D
Frankel				A, B, C, D	A, B, C, D, E	

<b>LOS Acute</b>						17.09
Mean		13.2	21.23 <sup>k</sup> , 19.77 <sup>l</sup>			
±SD		±16.92	±21.9 <sup>k</sup> , ±18.73 <sup>l</sup>			
Median						
Range	18.11-21.61					
<b>LOS Rehabilitation</b>						
Mean	42.89 <sup>h</sup> , 62.53 <sup>i</sup> , 57.98 <sup>j</sup>	56.76	72.16 <sup>k</sup> , 70.76 <sup>l</sup>	239	198 <sup>m</sup> , 222 <sup>n</sup>	41.49
±SD		±34.28		±168	±10, ±9	
Median						
Range						

<sup>h</sup>Age 18-39, <sup>i</sup>Age 40-59, <sup>j</sup>Age 60+, <sup>k</sup>Men, <sup>l</sup>Women, <sup>m</sup>Treated conservatively, <sup>n</sup>Treated surgically



<b>Author</b> <b>Variables Investigated</b>	<b>Cifu et al. [39]</b>	<b>Dryden et al. [23]</b>	<b>Putzke et al. [24]</b>	<b>Biering-Sørensen et al. [40]</b>
<b>Year of investigation</b>	1988-1996	1992-1994	1988-1999	1975-1984
<b>Number of patients</b>	2099	233	212 pairs of cases	267
<b>Injury level</b>	C1-C8	Cervical, Thoracic, Lumbar/Sacral/Cauda Equina		Cervical, Thoracic, Lumbar, Sacral
<b>Injury extent</b> ASIA Frankel	A, B, C, D			

<b>LOS Acute</b>				
Mean	16.3		22.1 <sup>p</sup> , 21.4 <sup>q</sup>	
±SD	±21.4		±22.2 <sup>p</sup> , ±19.9 <sup>q</sup>	
Median	10.0			
Range	?-159			
<b>LOS Rehabilitation</b>				
Mean	86.0	26.0 <sup>o</sup>	60.0 <sup>p</sup> , 57.8 <sup>q</sup>	351 <sup>o,r</sup> , 261 <sup>o,s</sup> , 294 <sup>o,t</sup> , 217 <sup>o,u</sup>
±SD	±52.6		±38.7 <sup>p</sup> , ±44.9 <sup>q</sup>	
Median	84			329 <sup>o,r</sup> , 230 <sup>o,s</sup> , 287 <sup>o,t</sup> , 196 <sup>o,u</sup>
Range	?-499	1-450 <sup>o</sup>		117-533 <sup>o,r</sup> , 68-627 <sup>o,s</sup> , 113-484 <sup>o,t</sup> , 56-487 <sup>o,u</sup>

<sup>o</sup>Includes both acute care and inpatient rehabilitation, <sup>p</sup>Nongunshot, <sup>q</sup>Gunshot, <sup>r</sup>Tetraplegia Motor complete, <sup>s</sup>Tetraplegia Motor incomplete, <sup>t</sup>Paraplegia Motor complete, <sup>u</sup>Paraplegia Motor incomplete



The aim of this research is to elucidate and analyze how societal services in practice are made available (or not available) and are utilized (or not utilized) by a group of individuals with traumatic spinal cord injuries (SCI). The thesis is based on three articles. The first is an inventory of Swedish societal support and services that one can apply for after a traumatic SCI. Twenty-five such forms are identified, which are primarily administered by two different authorities. The consumers expressed their frustration with this organization and the feeling of being checked up on and called into question. The second article analyzes how general ethical guidelines are challenged by situated ethics in the design context. This corresponds to how the intentions that motivate the allocation of societal services are challenged by the experiences of the people directly affected when it comes to treatment, degree of complexity, and the transparency and predictability of the systems. The third article deals with inpatient care utilization by a Swedish SCI group and the usefulness of this data in surveying total utilization. In an effort to validate the contents of the database, it became apparent that it was impossible to establish the group's total inpatient care utilization. The articles also discuss methodological aspects of the surveying and documentation of societal services. The thesis can be downloaded at: [www.english.certec.lth.se/doc/societalservices](http://www.english.certec.lth.se/doc/societalservices)



Division of Rehabilitation  
Engineering Research,  
Dept. of Design Sciences,  
Faculty of Engineering,  
Lund University



Certec, LTH  
P.O. Box 118  
SE 221 00 Lund, Sweden



Sölvegatan 26  
SE 223 62 Lund, Sweden



+46 222 46 95



+46 222 44 31



[lena.leeven@certec.lth.se](mailto:lena.leeven@certec.lth.se)



<http://www.certec.lth.se>

The explicit purpose Certec's research and education is to achieve better opportunities for people with disabilities through useworthy technology, new design concepts and new individualized forms of learning and searching. Certec currently employs 25 people. The organization's annual turnover is 15 million SEK (1.6 million Euro).

LICENTIATE THESIS, CERTEC, LTH NUMBER 1:2006

ISBN 91-631-8930-5

MAY 2006

CAMILLA NORDGREN

SOCIETAL SERVICES AND TRAUMATIC SPINAL CORD INJURY:  
A MULTIFACETED INTERACTION