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GUILLAIN-BARRÉ SYNDROME: DISABILITY, QUALITY OF LIFE, ILLNESS EXPERIENCES AND USE OF HEALTHCARE

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ABSTRACT

Aim: The overall aim of this thesis was to provide a comprehensive description of how individuals may be affected by Guillain-Barré syndrome (GBS), in terms of on body function, activity, and participation as well as on health-related quality of life, and describe changes over time during the first 2 years after onset. Other aims were to describe the use of healthcare and patient satisfaction, and to report on the subjective experiences of falling ill with GBS.

Methods: In Papers I-II, 42 patients diagnosed with GBS were followed for 2 years with repeated evaluations of functioning, health-related quality of life and coping capacity. Assessment of functioning included testing of muscle strength, facial functions, grip strength, 10 meter walking, manual dexterity, balance, motor performance, pain, fatigue and respiratory function. Measures of sensory functions were performed by vibration, paraesthesia and pinprick/light touch. Measures of disease-related variables included the disease-specific Hughes Scale, falls and autonomic dysfunction. Independence in activities of daily living (ADL) was assessed via the Barthel Index and extended Katz ADL Index. Frequency of social/lifestyle activities was assessed via the Frenchay Activity Index. Health-related quality of life was assessed via the Sickness Impact Profile and coping capacity via the Sense of Coherence Scale. Evaluations were performed primarily as home visits at five occasions during the 2-year follow-up period. In Paper III the use of health-care, patient satisfaction and impact on caregivers during the 2-year period were investigated. Paper IV was a qualitative study. Participants were interviewed at 2 years after onset of GBS. An interview guide was used with three thematic areas: experience of onset of GBS, thoughts regarding the diagnosis and illness experience during hospital care. The transcribed interviews were analyzed using content analysis.

Results: Mean age of the 42 patients was 52 years. Twenty-four patients (57%) were male, 16 patients (38%) had a pre-existing illness, 36 patients (86%) had immunomodulatory treatment in the acute phase, and nine patients (21%) required ventilator support for 5-287 days (Papers I-III). Most significant improvement in muscular speed and strength occurred within the first year after onset of GBS, especially in the first 6 months. For some individuals there was a continuing improvement during the whole study-period. At 2 years after GBS onset 55% of patients had reduced muscle strength in the lower body, 31% had reduced grip strength, 48% reported paraesthesia, 33% experienced pain, and 40% fatigue (Paper I).

Most significant improvement in ADL-capacity occurred the first 6 months after GBS onset. There was no significant change in social/lifestyle activities at 2 years after onset, compared to a retrospective measure before onset of GBS. Seven patients (17%) were on sick leave or had retired due to residual deficits of GBS at 2 years after onset. Regarding health-related quality of life, the physical dimensions of the Sickness Impact Profile showed significant improvement the first year after onset and the psychosocial dimensions the first 6 months. Scores on the Sense of Coherence Scale were stable over the 2- year period (Paper II).

Duration of in-patient hospital stay was more than 3 months for 26% of patients. Rehabilitation accounted for the major part of care after GBS. Seventy-four percent of the outpatient care during the 2-year period consisted of visits to physical

therapists in primary care or day-visits at rehabilitation centers. Patient satisfaction with the received care was overall high. Dissatisfaction was reported regarding cost of care and disease-specific information. Several patients had informal help from an informal caregiver during the 2 years. Spouses of the patients expressed a heightened concern and responsibility (Paper III).

Thirty-five of the 42 patients participated in an interview. They described their experiences of the onset as either an incomprehensible, prolonged deterioration or as a frightening rapid onset. Regarding the diagnosis, the theme confidence in recovery dominated. They relied heavily on the reassurance of a positive prognosis. As illness progressed during the initial hospital care, the participants described fear and insecurity in a vulnerable situation, a hopeful improvement but also an alarmingly slow recovery (Paper IV).

Conclusions: During the first 6 months after GBS onset the primarily recovery occurred. Rehabilitation must therefore start early and the prognosis of recovery can be estimated on the grade of recovery at 6 months. During the period from 1 year to 2 years, recovery was evident in a few patients. These patients need continuing rehabilitation. Disability was seen in about 25% of patients at 2 years after onset. Psychosocial support should be included early in the rehabilitation for patients identified to have a slow, incomplete recovery. GBS may have widespread impact in several life areas over time and suggest that health professionals need to have a broad, long-term perspective when treating patients with this disorder.

SVENSK SAMMANFATTNING

Bakgrund: Årligen insjuknar ca 150 personer i Sverige i akut inflammatorisk polyradikuloneuropati, Guillain-Barrés syndrom (GBS), som drabbar de perifera nerverna. Insjuknandet är oftast akut med tilltagande symtom, muskelsvaghet och sensoriska symtom, under två veckors tid. Efter progress fasen följer oftast en stationär fas på 1-4 veckor, och sedan börjar personen förbättras.

Syfte: Det övergripande syftet med avhandlingsprojektet var att beskriva hur personer som insjuknar i GBS påverkas avseende kroppsfunktion, aktivitet, delaktighet och hälsorelaterad livskvalitet, samt beskriva förändringar över tid de 2 första åren efter insjuknandet. Syftet var också att beskriva utnyttjandet av hälso- och sjukvård, patientillfredställelse och påverkan på anhöriga, samt att beskriva de individuella erfarenheterna av att insjukna i GBS.

Metod: Fyrtiotvå personer följdes under 2 år med upprepade mätningar av funktionstillstånd, hälsorelaterad livskvalitet och coping förmåga (Delarbete I och II). Vid varje mättillfälle undersöktes muskelstyrka: 0-5-skalan; finmotorik: 9-Hole-Peg-Test; greppstyrka: Martin Vigorimeter; balans: Bergs Balansskala; 10 meters gångtest; motorisk förmåga: Lindmark Motor Capacity Assessment; lungfunktion: spirometer; ansiktsmuskelfunktion; smärta och trötthet: VAS; och känsel. Aktiviteter i det dagliga livet (ADL) undersöktes med Barthel Index och Katz ADL Index. Återgång i arbete och Frenchay Activity Index, användes som mått för aktivitet och delaktighet. Hälsorelaterad livskvalitet undersöktes genom Sickness Impact Profile och coping förmåga genom Sense of Coherence Scale.

I delarbete III samlades data in om utnyttjande av hälso- och sjukvård och social service genom dataregister, medicinska journaler och ett studiespecifikt protokoll för de 42 personerna. Patientillfredställelse, behov av informell hjälp och påverkan på anhöriga undersöktes med frågeformulär i samband med hembesök.

Delarbete IV var en kvalitativ intervjustudie. Alla de 42 personerna tillfrågades om deltagande och 35 tackade ja. Intervjuerna gjordes med stöd av en intervjuguide med tre teman; insjuknandet, diagnosen och sjukdomsupplevelsen under den första tiden på sjukhus. Som analysmetod användes latent, tolkande, innehållsanalys.

Resultat: Medelåldern var 52 år. Alla utom två personer var helt självständiga i ADL före insjuknandet. Nio personer behövde vårdas i respirator mellan 5-287 dagar. Trettiosex personer fick behandling med intravenöst immunoglobulin eller plasmaferes i det akuta skedet.

Delarbete I: Signifikanta förbättringar av kroppsfunktion skedde främst det första året efter insjuknandet, och särskilt det första halvåret. Vid 2 år efter insjuknandet hade 55 % av personerna fortfarande mätbar nedsättning av motoriska och/eller sensoriska funktioner. Muskelstyrka följt av greppstyrka var de variabler som var mest nedsatta vid alla mättillfällen. Tre personer kunde inte gå 10 meter vid 2-år uppföljningen. Funktionen i ansiktsmusklerna var nedsatt hos 16 personer vid 2 veckor efter insjuknandet och fortsatt hos 5 vid 2 år, främst avseende rörelser med munnen. Sjutton personer rapporterade trötthet vid 2 år efter insjuknandet och 14 patienter smärta.

Delarbete II: Vid 2 veckor efter insjuknandet var 32 personer beroende av hjälp i personlig ADL, jämfört med 5 vid 2 år. För instrumentell ADL var 41 personer beroende vid 2 veckor, och fortsatt 11 patienter vid 2 år. Sju personer var fortsatt sjukskrivna eller hade blivit sjukpensionärer vid 2 år. I den fysiska dimensionen i Sickness Impact Profile, och kategorierna Sömn, Fritid och Hushållsarbete märktes nedsättning av den hälsorelaterade livskvaliteten. Signifikanta förändringar märktes det första året efter insjuknandet avseende ADL och hälsorelaterad livskvalitet, och särskilt det första halvåret. Coping förmåga var stabilt över 2-årsperioden.

Delarbete III: Personerna vårdades inneliggande på sjukhus i medeltal 82 dagar. Rehabilitering stod för den största delen av vården. Personerna var överlag nöjda med den vård de fått, men flera angav missnöje med brist på sjukdomsspecifik information och kostnader för vården. Vid 2 år efter insjuknandet hade tre personer kommunal hemtjänst. Ytterligare åtta personer behövde hjälp av anhöriga och vänner för att klara ADL. Make/maka till personerna med GBS uttryckte ett ökat ansvar för familj och hushåll vid 1 år och 2 år efter insjuknandet.

Delarbete IV: Vid analys av intervjuerna framträdde två tydliga teman för insjuknandet, upplevelsen av en obegriplig, långsam och tilltagande försämring samt upplevelsen av en skrämmande snabb försämring. De flesta personerna tog fasta med förtröstan på prognosen att bli frisk, men i ett senare skede beskrevs besvikelse över en alltför positiv prognos. Allt eftersom försämringen framskred beskrev personerna rädsla och osäkerhet i en sårbar situation och inför långsam förbättring. Flera personer beskrev dock hoppfull förbättring redan under den första tiden på sjukhus.

Konklusion: Personerna förbättrades främst de första 6 månaderna efter insjuknandet i GBS. Rehabiliteringen måste därför påbörjas tidigt. Fortsatt förbättring mellan det första och andra året var märkbart för ett färre antal personer. Det är viktigt att identifiera deras behov av rehabilitering under lång tid. Ungefär 25 % av personerna uppvisade aktivitetsbegränsning vid 2 år efter insjuknandet. För personer med långsam förbättringstakt och risk för kvarstående problem är det av vikt med tidigt psykologiskt stöd. Vid rehabilitering av personer med GBS är det av vikt för hälso- och sjukvårdspersonal att ha ett brett perspektiv över lång tid.

LIST OF PUBLICATIONS

This thesis is based on the following publications, which are referred to in the text by their Roman numerals.

I. **Forsberg A**, Press R, Einarsson U, de Pedro-Cuesta J, Widén Holmqvist L
Impairment in Guillain-Barré syndrome during the first 2 years after onset: a prospective study
Journal of the Neurological Sciences 2004; 227; 131-138

II. **Forsberg A**, Press R, Einarsson U, de Pedro-Cuesta J, Widén Holmqvist L
Disability and health-related quality if life in Guillain-Barré syndrome during the first two years after onset: a prospective study
Clinical Rehabilitation 2005; 19: 900-909

III. **Forsberg A**, de Pedro-Cuesta J, Widén Holmqvist L
Use of health-care, patient satisfaction and burden of care in Guillain-Barré syndrome
Journal of Rehabilitation Medicine 2006; 38: 230-236

IV. **Forsberg A**, Ahlström G, Widén Holmqvist L
Falling ill with Guillain-Barré syndrome: patients' experiences during the initial phase.
Submitted

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LIST OF ABBREVIATIONS

ADL	Activities of Daily Living
GBS	Guillain-Barré syndrome
HIR	Hospital In-Patient Registry
ICF	International Classification of Functioning, Disability and Health
ICIDH	International Classification of Impairment, Disability and Handicap
IQR	Inter-quartile range
IVIg	Intravenous immunoglobulin treatment
LMCA	Lindmark Motor Capacity Assessment
MMSE	Mini Mental State Examination
PEF	Peak Expiratory Flow
SD	Standard deviation
SF-36	Short Form-36
SIP	Sickness Impact Profile
VAS	Visual Analogue Scale
VPT	Vibration perception threshold

1 BACKGROUND

1.1 GUILLAIN-BARRÉ SYNDROME

> " -I had an intense stomach flu that lasted for several days. When I finally got well, I noticed that my arms and legs felt heavy. Later that evening I was trying to brush my hair, but I dropped the hairbrush, as I could not hold on to it. I woke up during the night and then I could not move. Nothing happened when I tried to move my hands or legs"
>
> " My knees still feel weak and shaky after 2 years. I avoid running because my legs tremble for a long while afterwards. I have been exercising to increase strength but it is still not the same as before this disease. It does not bother me at home doing house-hold chores but I have had to change some of my work duties"

These two quotations from participants in Paper IV illustrate aspects of Guillain-Barré syndrome (GBS) that has been the focus of this thesis, how GBS can affect individuals in the initial and later phases. This thesis presents a description of acquiring and having GBS in Sweden in the aspects of function, activity, participation, quality of life, use of healthcare as well as the subjective experiences of the patients with GBS.

GBS is an inflammatory demyelinating polyradiculoneuropathy of acute or sub acute onset where the etiology is not fully established. GBS is a common cause of acute flaccid paralysis, but it is still often an unknown disease to the general population. The disease was named after the French neurologists Georges Guillain and Alexander Barré who, together with André Strohl, presented a paper (1, 2) in 1916 on two soldiers who had recovered from an acute paralyzing illness.

GBS occurs in all parts of the world and at all ages. The annual incidence is 1-2 cases per 100 000 population worldwide (3). On Swedish data, the incidence has been calculated at 1.7 new cases per year per 100,000 population (4), increasing with age and higher in males. The fatality rate of GBS is about 5 % in the West, and is mainly due to autonomic failure or complications arising from respiratory insufficiency (5-7).

In recent years studies have shown that GBS consists of different subtypes of acute peripheral neuropathy (8). The most common subtype in Europe and North America is acute inflammatory demyelinating polyradiculoneuropathy. In other parts of the world axonal neuropathy affecting motor and/or sensory nerves are more evident.

In the field of research, interest in GBS has been growing in recent years. Since this thesis was planned and started several studies have been published on different aspects of disability.

1.1.1 Clinical picture and management

GBS typically begins with paraesthesia in the hands or feet, followed within days by leg weakness that makes walking difficult. Antecedent events are found in about 60-

70% of patients, the most frequent ones being upper respiratory infections and gastroenteritis (6, 9, 10). The diagnosis of GBS is based on the clinical features summarized by the Asbury criteria (11). The cardinal clinical features consist of progressive relatively symmetrical weakness, mild sensory symptoms and areflexia. The facial nerves are often affected, frequently bilaterally. Autonomic involvement is common and may cause urine retention, cardiac arrhythmia, sweating and postural hypotension. Elevation of protein in the cerebrospinal fluid is strongly supportive of the diagnosis. Most patients will have evidence of nerve conduction slowing or block. The disease reaches its nadir by 2 weeks in most patients, and by 4 weeks in nearly all (8). In about 25% of patients, mechanical ventilation is required because of weakness of the respiratory muscles. After a plateau phase of 1-4 weeks, recovery begins with return of proximal strength, followed by distal. Recovery may take weeks and months.

Immunotherapy, intravenous immunoglobulin (IVIg) or plasma exchange, is recommended as appropriate treatment within 2 weeks from onset (12). Treatment with plasma exchange has shown to hasten recovery compared to only supportive care (13). Since a randomized controlled trial showed that IVIg has similar efficacy to plasma exchange (14), IVIg has replaced plasma exchange as the preferred treatment because of its greater convenience (15). In Sweden, both plasma exchange and IVIg are used as treatment options although IVIg is preferred. Treatment with corticosteroids has shown to be of no benefit, and is not recommended (12, 16).

Supportive care remains the mainstay of treatment (17). The concept of supportive care includes multidisciplinary care to prevent and manage complications as well as multidisciplinary rehabilitation programs. Supportive care in the acute phase includes prophylaxis for deep vein thrombosis, respiratory monitoring, cardiac monitoring, pain management and management of bladder and bowel dysfunction (17). In the later phase early rehabilitation is recommended with individual programs of mobilization and exercises to prevent contractures and restore functioning.

1.2 THE CLASSIFICATION OF FUNCTIONING, DISABILITY AND HEALTH

When parts of this thesis (Paper I and II) were being planned, the International Classification of Impairment, Disability and Handicap (ICIDH) (18) was still in use. The ICIDH was used as a framework to structure the design to encompass the consequences of GBS to the different aspects of life. With the introduction of the International Classification of Functioning, Disability and Health (ICF) (19) by the WHO in 2001, it was evident that the ICF should be used as a conceptual framework for describing functioning, activity and participation in this thesis. However, most of the studies referred to have not used the ICF, which makes comparison of results difficult.

The ICIDH was often described as a “consequences of disease” classification (18), while the ICF is described as a “components of health” classification (19). As a classification, the ICF systematically groups different domains for a person in a given health condition. Functioning is an umbrella term encompassing all body functions, activities and participation, and the negative term disability serves as an umbrella term for impairments, activity limitations and participation restrictions (Figure 1). The contextual part of Environmental factors and Personal factors makes the ICF considerably different from the ICIDH. Personal factors are the particular background

of an individual's life and living, and comprise features of the individual that are not part of a health condition (e.g. gender, age, education, coping styles). However, quality of life is a phenomenon that the ICF does not consider (20).

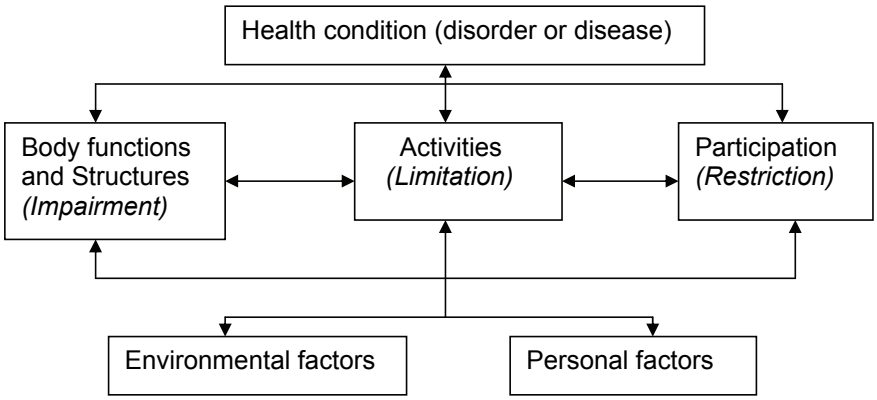

***Figure 1**. The theoretical model of the interactions between components of the ICF (19)*

1.3 FUNCTIONING AND DISABILITY AFTER GUILLAIN-BARRÉ SYNDROME

GBS was previously thought to have a favorable outcome, but studies performed during the past three decades have shown residual symptoms in varying numbers of 8-52% of patients, percentages varying due to different follow-up time-points, outcome measures used and patient selections. Table 1 presents an over-view of the found studies in the databases Medline and Cinahl, which have investigated outcome by examining the patients at follow-up time-points of 6 months, 1 year and 2 years. Some of these studies (5, 7, 9, 10, 21-24) have defined poor outcome via the scale designed by Hughes et al (25), introduced in a steroid trial in 1978. It is a crude 7-point scale ranging from grade 0 - equaling healthy - to grade 6 - equaling dead. The Hughes' scale is considered reliable, but has been criticized for not distinguishing between the potentially wide ranges of functional disability within the grades (22). In other studies presented in Table 1, the definition of a poorer outcome is not consistent or is not stated clearly. A poorer outcome was presented as residual deficits, incomplete recovery, disability or limited functioning that make comparison difficult. In Table 1, the term incomplete recovery is used to encompass all of the above, since most of the studies shown in Table 1 were either performed before the ICF or do not use the ICF terminology. The meaning of the term disability in the studies in Table 1 was therefore not the same as in the ICF. Overall, most studies have focused on body function, and only a few studies have investigated activity and participation. A variety of disability scales may be needed to demonstrate the subtlety of the deficit following recovery (26).

Table 1. *Reported incomplete recovery after Guillain-Barré syndrome at follow-up time-points of 6 months, 1 year and 2 years after onset of disease. The descriptions of outcome presented by the authors of different the studies are used in the table.*

Author, year	Percentages of patients with incomplete recovery	Design and method in study
	Follow-up time-point 6 months after GBS onset	
Andersson, 1982 (27)	27 % had functionally significant sequelae	Retrospective description of patients treated at Swedish neurological clinics. Number of participants, 60.
Emilia-Romagna study group, 1997 (9)	36%; 20% had minor signs and 16% had limited functioning	Prospective multi-centre study, using the Hughes scale. Number of participants, 94.
Cheng, 2003 (28)	46%; 36% had residual signs and 10% were unable to walk without aid	Prospective study. Number of participants, 71.
Sedano, 1994 (10)	46% were unable to do manual work or had decreased walking ability	Retrospective study using a modified Hughes scale. Number of participants, 60.
	Follow-up time-point 1 year after GBS onset	
Winner, 1993 (29)	8% needed assistance with simple activities of daily living	Retrospective study. Number of participants, 62.
French cooperative group, 1992 (30)	11% had severe motor disability independent of treatment, but more patients had decreased muscle strength in the control group	A randomized controlled study comparing plasma exchange treatment to no treatment. Number of participants, treatment group 99 and control group 98.
Plasma Exchange/ Sandoglobulin Guillain-Barré Syndrome Trial Group, 1997 (31)	15% were unable to walk unaided. No difference between groups	A randomized controlled study comparing plasma exchange to intravenous immunoglobulin. Total number of participants, 365.
Hadden, 2001 (32)	15% had poor outcome defined as death or inability to walk unaided	Prospective immunotherapy treatment study. Number of participants, 229.
Sedano, 1994 (10)	18% were unable to do manual work or had decreased walking ability	Retrospective study using a modified Hughes scale. Number of participants, 60.
Winer, 1988 (24)	20 % were unable to do manual work or had decreased walking ability	Prospective study using the Hughes scale. Number of participants, 100.
Cheng, 2003 (5)	31% had severely affected walking	Retrospective study using the Hughes scale. Number of participants, 96.
Rees, 1998 (23)	31% were unable to run or needed assistance for ambulation	Prospective population-based study using the Hughes scale. Number of participants, 79.
Cheng, 2003 (33)	40% had residual deficits, mostly minor	Retrospective study using a modified Barthel Index
Bahou, 1996 (34)	45% had not regained independent locomotion	Retrospective study. Number of participants, 47.
Fletcher, 2000 (22)	48% had not regained independent walking and among them 7% were still ventilator-treated	Retrospective study using the Hughes scale, a selected group of patients all of whom required ventilation support. Number of participants, 60.
Cheng, 2000 (6)	52%; 42% had mild residual signs and 10% had moderate to severe disabilities	Prospective Swedish study. Number of participants. Number of participants, 53.

	Follow-up time-point 2 years after GBS onset	
	12% were unable to do manual work or had decreased walking ability	Retrospective study using a modified Hughes scale. Number of participants, 60.
Italian Guillain-Barré study group, 1996 (35)	16% had residual deficits that interfered with activities of daily living	Prospective multi-centre study. Number of participants, 297.
Chio, 2003 (7)	20% were unable to do manual work or had decreased walking ability	Prospective population-based study using the Hughes scale. Number of participants, 108.

Table 2 presents cross-sectional studies found in the databases Medline and Cinahl, where the patients were evaluated at varying periods of time after GBS onset. In addition to these studies, based on a self-report questionnaire, Van Koningsveld et al (36) found that 46% of 139 patients reported reduced hand function and an inability to run. Bersano et al (37) interviewed 70 patients by phone 3-5 years after onset and found that 20% of patients reported residual functional impairment. GBS can affect all ages, but the prognosis for children is often better than for adults. Despite good functional recovery, mild residual deficits are seen even in children. In a study by Vajsar et al, 46% of children had deficits such as diminished or absent tendon reflexes and diminished sensory function (38).

***Table 2**. Reported incomplete recovery after Guillain-Barré syndrome in cross-sectional studies*

Author, year	Percentages of patients with incomplete recovery	Design and method of study
Löffel, 1977 (39)	43% had residual symptoms, mainly motor weakness	Evaluation1-12 years after onset. Number of participants, 90.
Nyland, 1984 (40)	13% had disabling motor impairments and an additional 27% had residual mild symptoms	Evaluation 1-15 years after onset. Number of participants 126.
De Jager, 2001 (41, 42).	30% of patients had moderate or severe residual paresis, and sensory signs were present in 49%	Evaluation 2-24 years after onset. Number of participants, 43.
Vedeler, 1997 (43)	21% had motor and 31% had sensory signs, mainly in the lower limbs	Evaluation 1-14 years after onset. Number of participants, 52.
Bernsen, 2001 (44)	31% had moderate or severe residual signs. 48% reported muscle aches	Evaluation 3-6 years after onset. Number of participants, 122.
Dornonville de la Cour, 2005 (21)	48% had residual neuropathy mainly in the legs independently of follow-up time and 15% had residual deficits	Evaluation 1-13 years after onset. Residual deficits were measured using the Hughes scale. Number of participants, 40.

1.3.1 Pain

Many patients experience GBS-related pain during the course of disease. Common pain syndromes are back and leg pain, dysesthetic extremity pain and myalgic extremity pain (45). Moulin et al (46) found that 89% of patients described pain at some time but mostly in the acute phase. In about 10% of patients, pain persisted at 6 months despite motor recovery.

1.3.2 Fatigue

Chronic fatigue is a typical symptom of neurological diseases and the main characteristics are limited endurance of sustained physical and mental activities and enhanced perception of effort (47). Related to GBS, fatigue has been discussed only in recent years as a persistent symptom after apparent recovery. Merkies et al (48) found that 80% of patients that had residual motor and sensory signs 3-6 years after onset of GBS experienced fatigue. Fatigue scores were not associated with physical dysfunction (48).

1.3.3 Activities of Daily Living

Assessment of activities of daily living (ADL) often includes assessing dependency in personal activities such as feeding and dressing, and dependency in instrumental activities such as housekeeping and transportation. In GBS few studies have investigated ADL-capacity. The Barthel Index and Functional Independence Measure have been used to measure changes in ADL-capacity during rehabilitation periods (26, 49). Using a self-administered questionnaire at 1 year after GBS onset, Bernsen et al found that 30% had reduced ADL-capacity and the patients reported they were not functioning at home as well as before (50).

1.3.4 Work and leisure activities

In recent years a few studies have been published that have investigated changes in work and leisure activities after GBS. A Danish study by Dornonville de la Cour et al (21) found that GBS had a negative effect on the job situation of 17% of working patients. Because of GBS, Bernsen et al (51) found that 38% of patients had changed their jobs and 44% had altered their leisure activities. Bernsen et al found (50) a similar result in a questionnaire-based study in patients 1 year after GBS onset, where 52% had altered their leisure activities. Bersano et al (37) interviewed patients by phone 3-5 years after onset and found 27% had made substantial changes in their job, hobbies or social activities.

1.4 HEALTH-RELATED QUALITY OF LIFE

There is a consensus in the literature that quality of life is to be viewed as both objective and subjective, thus as a multidimensional concept. The term objective refers to factual conditions of life and overt behavior whereas the term subjective refers to attitudes, expectations and life experiences (52). According to Post et al there are three ways to make quality of life operational in the literature, by equating quality of life with health, by equating it with wellbeing and by treating it as a super ordinate construct (53). In this thesis the first way has been chosen, the approach of measuring quality of life by means of health indicators. Health-related quality of life measures concentrate on the functional effect of an illness as perceived by the patient (53). The Sickness Impact Profile (SIP) (54) and Short Form-36 (SF-36) (55) are examples of questionnaires that measure behavioural functions as consequences of health and disease. In neurological conditions, it has been suggested that outcome evaluation should be extended from a focus on disease symptoms to the impact of illness, e.g. greater use of quality of life measures (56). In GBS, only three studies

have been identified that includes measures of health-related quality of life, one study using the SIP (57), and two studies the SF-36 (21, 58). All three studies found lower health-related quality of life in the GBS patients compared to healthy control groups, especially in terms of physical function (21, 57, 58). These three studies had cross-sectional design but with different follow-up time periods.

1.5 COPING CAPACITY

In the ICF (19), personal factors comprise features of the individual that are not part of a health condition, where coping style is one feature. Coping is defined by Lazarus & Folkman as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of a person" (59) (pages 141-180). Coping is seen as a process to manage stressful conditions. Antonovsky constructed the concept sense of coherence to describe the amount of resources available for a person to cope with different life stressors (60). Sense of coherence is defined as a global orientation towards life and consists of three components: comprehensibility, manageability and meaningfulness. The Sense of Coherence Scale (61) that Antonovsky developed measures the ability to manage different life stressors, such as - in this study - falling ill with GBS. He regarded the sense of coherence as a fairly stable quality fully developed at around the age of 30. The general view is that a person with a strong sense of coherence tends to manage the stresses of life better, whereas individuals with a weak sense of coherence tend to be more vulnerable to ill health (60). An association between high scores on the Sense of Coherence Scale and low scores on the SIP has been previously reported (62).

1.6 FALLING ILL WITH GUILLAIN-BARRÉ SYNDROME

To suddenly be struck by disease is an experience that only the individual affected can describe. In stroke, it has been suggested that the whole of the individual's being is challenged (63). Stroke, like GBS, often has an acute onset, and being stricken by a stroke means abruptly falling victim to an illness characterized by paralyses and sensory lapses (63). In patients with stroke, too, the overwhelming nature of the onset precipitates feelings of immense uncertainty (64). In the literature, research describing the personal experiences of GBS is limited. In an Australian study, five persons were interviewed to explore their experiences during the recovery phase (65). These persons described the course of GBS as moving from dependency to independency. Two semi-structured interview studies focused on psychosocial issues during intensive care (66, 67). They found that anxiety, disorientation and stress were common during mechanical ventilation. Apart from these three studies, a few case reports (68-71) and autobiographies (72-75) report personal experiences of GBS, often with the focus on intensive care; the vulnerability of suddenly being helpless, a devastating illness but also a hopeful recovery.

1.7 FUNCTIONING OF SPOUSES AND RELATIVES

Coping with the situation after discharge from hospital can be distressing both for the patients and their spouses, a finding seen in studies of stroke (76). In GBS, only one study has been found that focus on relatives. Bernsen et al (77) presented a study in 2066 that investigated the effects of GBS on the psychosocial functioning of close

relatives. During the first few months the relatives were anxious, had somatic complaints and experienced social dysfunction. This resolved over time, and had subsided by one year.

1.8 HEALTH SERVICES

1.8.1 Hospital and out-patient care

In Sweden, the public system provides hospital and primary care for the resident population. In general, patients requiring acute neurological care for more rare conditions such as GBS are attended to at the larger hospitals. Primary care centers and out-patient rehabilitation centers provide further rehabilitation on discharge from hospital. The rehabilitation setting may be dependent upon geography as rehabilitation centers are mainly in the larger cities.

In a worldwide perspective on the treatment of GBS, hospital care is often required in the acute phase and for rehabilitation during recovery in the later phase. The reported length of stay in hospital varies according to the disease severity and from one country to another, and in published studies the range is wide. In retrospective studies, the mean length of in-patient stay at a hospital varied from 23-86 days (10, 78-82). The duration of in-patient hospital stay increased with rising age (79, 81, 82), need for ventilator support (80, 81, 83), autonomic dysfunction (80), facial dysfunction (80) and poor walking ability at 1 month (6).

1.8.2 Patient satisfaction

The patient's view on what is important in connection with the care they receive may be seen as an important aspect of quality of care (84). However, this has not been studied earlier in the care of patients with GBS. Assessment of quality of care from the patient's perspective has often been operationalized in the literature as patient satisfaction (84). Patient satisfaction, a multidimensional concept, therefore includes the elements of subjectivity, expectation and perception (85). The aspect of need should be taken into consideration, however, as the need for care defined by the patient and the need defined by the health care might not be congruent (86). The perceived need for medical care is equated with the services that an individual with a given state of health believes he ought to utilize, compared to the medically defined need which is equated with the services that the health care system believes ought to be utilized by an individual with a given state of health (86). The Swedish study by Wilde et al stated that the patient's perceptions of quality of care should be considered from both a rational and a human aspect (87). Ware et al conceptualized patient satisfaction as a patient's evaluation of health care services and providers (88). Ware et al suggested a taxonomy with dimensions that are important characteristics of patient satisfaction: technical quality, accessibility, finances, availability, continuity, efficacy, physical environment and interpersonal manner (88).

1.9 PHYSIOTHERAPY AND REHABILITATION

1.9.1 Definition of physiotherapy

According to the World Confederation for Physical Therapy, the nature of physical therapy is "concerned with identifying and maximizing movement potential, within

the spheres of promotion, prevention, treatment and rehabilitation. Physical therapy includes the provision of services in circumstances where movement and function are threatened by the process of ageing or that of injury or disease. Full and functional movement are at heart of what it means to be healthy". (89).

In 1998 the Swedish Association of Registered Physiotherapists established a definition of physiotherapy as a subject and profession (90). The subject comprises knowledge and studies of human movement, and movement science is the main scientific basis. The profession consists of the duty to prevent, examine and treat disturbances of function that limits or threaten to limit the human capacity for movement.

1.9.2 Physiotherapy and rehabilitation in Guillain-Barré syndrome

There have been few systematic studies on the efficacy of rehabilitation, including physical therapy for patients with GBS. In general, rehabilitation has been adapted from experiences and studies on other neuromuscular diseases. Since GBS is a disorder characterized by defects in several physiological systems, the patients may present a variety of findings such as muscle weakness in arms and legs, pain, fatigue, facial paresis, ventilator dysfunction and autonomic dysfunction. In 2004, a Cochrane Systematic Review was published on exercise in peripheral neuropathy (91). Only three randomized or quasi-randomized controlled trials were found, none involving acute peripheral neuropathy, e.g. GBS. These three studies comprised patients with Charcot-Marie-Tooth disease, peripheral neuropathy associated with diabetes mellitus and chronic inflammatory demyelinating polyradiculoneuropathy. The review found inadequate evidence to evaluate the effect of exercise on disability in peripheral neuropathy, but found evidence that strengthening exercises moderately improve muscle strength.

Only one systematic exercise study has been published on patients with GBS, where 16 patients with relatively good recovery from GBS bicycled 3 times per week for 12 weeks (92). These patients were in a stable phase. Self-reported fatigue decreased and physical fitness improved significantly with this training regime. Two case reports also support the notion that endurance exercise training could improve aerobic capacity and strength in GBS patients with residual deficits (93, 94).

In addition, a couple of case reports have been published presenting different exercise regimes that the authors of the specific case report found useful in their clinical practice. Neither of the case-reports includes a systematic evaluation of the exercise regime. Case reports from the acute phase include exercise regimes: hydrotherapy for improving range of motion (95), transcutaneous electrical nerve stimulation for pain management (96) and continuous passive motion for preventing contractures (97). In the later rehabilitation phase, there are case reports that present exercise regimes: electromyographic feedback for improving muscle function (98, 99), treadmill training with partial body weight support for task-specific training of gait (100), podiatron for muscle strengthening (101) and neurodevelopmental sequencing for promoting gross motor skills (102).

These studies support the clinical experience that treatment in the acute phase should include gentle strengthening and a range of motion exercises to prevent contractures and complications (17, 103-105). In later stages, exercise programs may be helpful in

combating fatigue, increasing muscle strength and improving cardio-pulmonary function (17). However, scientific evidence is scarce.

1.10 THE NEED FOR A PROSPECTIVE STUDY OF DISABILITY, QUALITY OF LIFE, ILLNESS EXPERIENCES AND USE OF HEALTHCARE

Uncertainty prevails of the extent of disability after GBS. The studies found, that are presented in Table 1 and Table 2, have mostly been based on only one 7-point scale to investigate disability, or did not define disability. Using a single scale to measure the scope of disability may not be comprehensive enough. Rather, a battery of sensitive outcome measures may be needed to fully describe and understand the effect of GBS on functioning and quality of life. In order to identify the patients' need for support over time, it is important to use longitudinal studies of GBS that monitors patients over the whole disease-period. No study has been found that investigates health-related quality of life from the onset of GBS and onwards. The concept of sense of coherence has not been studied before in patients with GBS and it is relevant to elucidate the coping process during the different stages of GBS and during subsequently living with residual deficits.

In order to identify the patients' need for support, it is important to understand how GBS is experienced from a personal view. As GBS can strike differently, from mild to severe, the experiences of falling ill with GBS may presumably differ. It is therefore necessary for the experiences of patients with heterogeneous disease-severity to be described.

In planning of rehabilitation services, it is important to have an overview of the amount of healthcare the patients need, both hospital care and out-patient care. Utilization of health-related services such as community care and technical aids has not been studied before in GBS, and this is also a part of care that must be taken into account in rehabilitation and continuing care. Patient satisfaction need to be included in the measure of various outcome aspects of care, and is of importance in the planning of rehabilitation services. This has not been studied before in patients with GBS. The burden of care and impact on family and relatives is an area of GBS that has attracted interest in recent years, and this needs to be studied further.

2 AIMS

The overall aim of this thesis was to provide a comprehensive description of how individuals may be affected by GBS, in terms of impact on body function, activity, participation as well as on health-related quality of life, and describe changes over time during the first 2 years after onset. Other aims were to describe the use of healthcare and patient satisfaction, and to report on the subjective experiences of falling ill with GBS.

The specific aims were:

- To provide a comprehensive description of impairment, effects on body function, in patients with GBS during the first two years after onset of GBS. Paper I.

- To describe disability, with the focus on: activity limitation and participation restriction; health-related quality of life; and sense of coherence in patients with GBS during the first two years after onset of GBS. Paper II.

- To describe utilization of healthcare resources, satisfaction with these resources, the amount of informal help and burden of care on spouses during the first two years after onset of GBS. Paper III.

- To describe the patients' experiences of falling ill with GBS, with the focus on the onset of disease and illness progress during hospital care. Paper IV.

3 METHODS

3.1 DESIGN

This thesis comprises four studies based on both quantitative and qualitative methods. Three studies have prospective non-experimental descriptive and comparative designs with longitudinal data collection. The fourth study is a qualitative study encompassing interviews with patients with GBS, using content analysis.

3.2 PATIENTS

This prospective study included patients from April 1998 to December 1999. The intention was to get a population-based sample of patients. Patients were therefore included from eight hospitals in central Sweden with a collective catchment area of about 3.6 million inhabitants in 1998: Karolinska University Hospitals at Huddinge and at Solna, Uppsala University Hospital, Örebro University Hospital, Västerås Hospital, Falun Hospital, Borås Hospital and Sahlgrenska University Hospital. Patients, above 18 years of age, diagnosed with GBS according to the criteria of Asbury and Cornblath (11) were given information about the study and asked about participation. Informed consent was obtained from each patient entering the study. The patients were then reported to a recruitment coordinator at Karolinska University Hospital at Huddinge. Of 49 patients initially recruited, five were not enrolled on the study - the original diagnosis for two patients was revised to chronic inflammatory demyelinating polyradiculoneuropathy and three patients were adjudged to be suffering from other diseases that prohibited evaluations- and two enrolled patients declined further contact during follow-up. Fatality was nil. Thus, a total of 42 patients were enrolled and followed for two years. At one year after onset, a clinical neurologist at Karolinska University Hospital at Huddinge confirmed the patients' diagnoses based on medical records.

Demographic characteristics including age, gender, family situation, nationality, type of housing, education and employment status, were collected at the baseline evaluation. Information on pre-existing illnesses were collected from medical records and checked with the patients. At the follow-up evaluations, the details of family situation, housing and employment were re-checked. Age, gender, nationality, housing, education and employment status may be classified to the component Personal factors in the ICF (19) and the family situation to the component Environmental factors. Information on antecedent medical events, immunomodulatory treatment, and length of treatment with mechanical ventilation was collected from medical records.

To investigate whether there was a selection bias, the study group was compared with all patients entered in the national Hospital In-Patient Registry (HIR) at the National Board of Health and Welfare with a discharge diagnosis of GBS. The HIR showed that, during the study-period, 124 patients over 18 years of age with a diagnosis of GBS had been discharged from the eight study hospitals; 46 (37 %) of these patients were initially recruited to the study, while conversely, 3 patients included in the study were not found in the HIR. At the Karolinska University Hospital at Huddinge, 22 patients were recruited, which was 86% of eligible patients with GBS registered in the HIR. At the other hospitals, the inclusion coverage was as follows: Örebro

University Hospital 62%, Karolinska University Hospital at Solna 26%, Borås Hospital 20%, Sahlgrenska University Hospital 19%, Västerås Hospital 17%, Falun Hospital 14% and Uppsala University Hospital 14%. For comparison, two subgroups were formed, patients at Karolinska University Hospital at Huddinge (Huddinge, n=22) and patients at the other hospitals (other hospitals, n=20). The two subgroups were compared regarding age, sex, pre-existing illness, antecedent events and treatment.

3.3 ASSESSMENT PROCEDURE IN PAPERS I-III

Baseline evaluations were planned at 2 weeks (±1 week) after the clinical onset of symptoms and follow-up evaluations at 2 months (±2 weeks), 6 months (±1 month), 1 year (±2 months) and 2 years (±2 months) after onset of GBS. Similar assessment schedules have been used in other studies, (10, 35).

Baseline evaluations were in reality performed median 18 days (range 4-42) after the onset of symptoms, mainly because of a sub acute onset that delayed the diagnosis. At 2 months, five patients were evaluated 3-28 days after the planned interval; at 6 months two patients were seen 7-11 days after and at 1 year one patient was seen 8 days after the planned interval. At 2 years, evaluation was delayed for five patients, 16-87 days after the planned interval because of difficulty scheduling follow-up visits with patients who were working.

For the most part, baseline evaluations were performed at the local hospital, and follow-up evaluations - to ensure compliance - in the patient's home. Each evaluation took 1-2 hour to complete. Two specifically trained physical therapists performed the evaluations, independently of one another. The author of this thesis (A.F) carried out 73 % of the evaluations, and a co-author of Papers I and II (U.E) performed the rest. Concordance in ratings was assessed, both prior to start of the study and throughout its course, and adjudged to be satisfactory.

The order of the measures was about the same at all evaluations, but account was taken of the medical status of the patients'. Physical measures were alternated with questionnaires. For patients in intensive care with ventilator support, the aspects of the measures that could not be fulfilled were instead conducted at the next evaluation.

3.4 MEASURES IN PAPERS I-III

An overview of the different measures and questionnaires used in Papers I-III and their relation to the components of ICF is presented in Table 3. Measures were chosen that would be feasible both in the patient's home and at the hospitals.

***Table 3**. Overview of measures and questionnaires in Papers I-III relative to the components of ICF*

Variables	Measures	ICF component
Paper I		
Mental function	Mini Mental State Examination	Body function
Motor function		
Muscle strength	Medical Research Council 0-5 scale	Body function
Facial function	Study-specific test of 5 facial functions	Body function
Grip strength	Martin Vigorimeter	Body function
Gait	Timed 10-meter walking	Activity
Manual dexterity	Nine-Hole Peg Test	Activity
Balance	Bergs Balance Scale	Activity
Motor performance	Lindmark Motor Capacity Assessment	Activity
Motor performance	Test of running 10 meters, jump and squat	Activity
Respiratory function	PEF	Body function
Pain	VAS	Body function
Fatigue	VAS	Body function
Sensory function	Biothesiometer Paraesthesia Pinprick/light touch	Body function
Disease-related variables	Hughes scale Complications: falls, urinary/ bowel disturbance, autonomic dysfunction, pressure sores, deep vein thrombosis	Activity Body function
Paper II		
ADL	Barthel Index Extended Katz ADL Index	Activity Activity
Social and lifestyle activities	Frenchay Activity Index	Activity and Participation
Health-related quality of life	Sickness Impact Profile	Not included in ICF
Coping capacity	Sense of Coherence Scale	Personal factor
Paper III		
Use of healthcare	Study-specific protocol	Environmental factors
Technical aids	Self-reported	
Patient satisfaction	Patient satisfaction questionnaire	Not included in ICF
Burden of care	Study-specific questionnaire	Environmental factors
Informal help	Study-specific protocol on time spent	Environmental factors

3.4.1 Mental function

Mental function was screened using the Mini-Mental State Examination (MMSE) (106) at the 2-week evaluation, or when convenient for the patient's medical status. The MMSE is a widely used test for screening of general cognitive performance. Validity and reliability are considered good (107) (pages 314-320). The MMSE includes 11 items, divided into two sections; the first requires verbal responses to orientation, memory and attention questions. The second section requires reading and writing and covers the ability to name, follow verbal and written commands, write a sentence and copy a polygon (106). For the patients with paresis in the arms that prohibited writing, these items were performed again at the next evaluation. The maximum score is 30 points, and the most commonly used cut-off point to indicate cognitive impairment is 23-24 points (107). The distribution of scores may vary due to educational level and increasing age (108).

3.4.2 Motor function

All the measurements of motor function were performed at all evaluations.

3.4.2.1 Muscle strength

Muscle strength was tested via the Medical Research Council 0-5 grading scale (109), which has been found to be a reliable outcome measure for patients with GBS (110). The 0-5 grading scale was also found to have good responsiveness over time in a study of patients with immune-mediated polyneuropathies (111). The following movements were tested: in the upper body, shoulder abduction, elbow flexion and extension, wrist flexion and extension, thumb abduction and neck flexion and extension; and, in the lower body, hip flexion, extension and abduction, knee flexion and extension, foot flexion and extension and toe extension. Scores were summed to a total score of 150 points, upper body maximum 70 and lower body 80.

3.4.2.2 Facial function

Paresis of the cranial nerves is common in the acute stages of GBS. The facialis nerve, the 7th cranial nerve, is most often affected. To test the motor function of the facialis nerve, a study-specific protocol was set up in which the patients were asked to perform five movements that were graded as affected or not affected; wrinkling the forehead, shutting the eyes, puckering the lips, smiling and yawning. This protocol has not been tested for validity or reliability.

3.4.2.3 Grip strength

Grip strength was measured with a Vigorimeter (112), using the medium-sized balloon; the highest value from three trials was recorded and compared with reference data (112). The Vigorimeter consists of a rubber bulb connected by a tube to a manometer; measures are expressed in kilopascals. The Vigorimeter measures grip pressure that is considered equivalent to force (113). Reliability is considered good for the general population (114). In a study of patients with polyneuropathy, the Vigorimeter was found to have high responsiveness over time (112). In this thesis (Paper I), values in grip strength were considered subnormal for ages 20-64 years at below 89 kilopascal (kPa) for men and below 72 kPa for women; in patients aged 65 years or more, values below 74 kPa were considered subnormal for men and below 58 kPa for women (112).

3.4.2.4 Gait

The patients were asked to walk 10 meters as fast as possible, and the time taken was recorded with a stopwatch. Walking aids were allowed. If the environment in the patient's home did not allow 10 meters, the individual concerned was requested to walk 5 meters, turn and walk 5 meters back at all evaluations. The process was recorded and replicated at the next evaluation. Validity and reliability for the 10 meter walking test are considered good in patients with neurological disorders (115, 116). Walking 10 meters on a 5-meter course with a turn is considered a reliable alternative (117). Gait speed (m/s) was calculated and compared with reference data (118). Gait speeds below 1.5 m/s for men and 1.4 m/s for women (118) were regarded as subnormal.

3.4.2.5 Manual dexterity

Manual dexterity was measured using a modified Nine Hole Peg Test (119). The patient was seated at a table and the time was recorded from the moment when the patient touched the first peg until all holes had been filled with pegs, one-handed. Pegs per second were then calculated. The Nine-Hole Peg test is a considered valid and reliable test for manual dexterity (120).

3.4.2.6 Balance

Balance was assessed using the Berg Balance Scale (121), which focuses on the ability of a person to maintain balance when asked to perform a series of movements. The Berg Balance Scale consists of 14 items that are scored 0-4, where a higher score indicates better balance. The items include sitting and standing unsupported, change of position from sit to stand and stand to sit, transfers from one chair to another, standing with eyes closed, standing with feet together, tandem standing, standing on one leg, turning trunk, retrieving object from floor, turning 360 degrees, stool stepping and reaching forward while standing. The Berg Balance Scale was originally developed for evaluation of geriatric patients and has high validity and reliability (121, 122).

3.4.2.7 Motor performance

Motor performance was tested using subscales from the Lindmark Motor Capacity Assessment (LMCA) (123): active performance with the arms and legs, mobility, rapid movements and passive movements. The items are mostly scored 0-3. The total score is a summation of the subscales, with a total range of 0-341, and the higher score the better motor performance. The LMCA is considered valid and reliable measure in patients with stroke (123, 124). It was originally developed to evaluate functional capacity after stroke (125), but has been used in assessing patients with multiple sclerosis (126). Because ceiling effects were expected, the LMCA was supplemented by three independent measures of motor performance at the 6-month, 1-year and 2-year evaluations: running 10 meters indoors, jumping leaving the floor 5 times and squatting without support.

3.4.3 Respiratory function

Respiratory function, peak expiratory flow (PEF), was tested in the sitting position with a handheld spirometer (Micro Spirometer, Micro Medical Instruments Ltd, Rochester, UK). PEF was tested at all evaluations. This handheld spirometer has been tested and found to have good accuracy and repeatability (127). The highest value from three trials was recorded and compared with reference data (128). PEF was measured as a marker of respiratory muscle weakness.

3.4.4 Pain

Pain intensity was measured using a visual analogue scale (VAS) (129) 100 mm in length, with “no pain” and “unbearable pain” as opposite extremes. The patients were asked to rate GBS-related pain experienced during the preceding week on the VAS at all evaluations. The VAS is widely used to measure pain intensity, and has been used in studies of GBS (46). Validity and reliability is considered good (107) (pages 342-345).

3.4.5 Fatigue

During the follow-up evaluations, many patients complained of being tired in a new way, described as fatigue. To get a description of the amount of fatigue, self-rated fatigue was added at the 1- and 2-year evaluations. Fatigue was rated using a VAS as fatigue experienced during the preceding week with “no fatigue” and “worst imaginable fatigue” as opposite extremes.

3.4.6 Sensory function

GBS can affect several sensory systems, and a variety of tests were therefore chosen. The tests were performed at all evaluations. Paraesthesia such as numbness, tingling or hyperaesthesia in the extremities or face, was graded by the patients themselves as either present or absent. Pinprick and light touch were assessed in the hands and feet and were graded as either affected or not affected. The patient was examined with eyes closed. Similar tests have been found to be reliable and valid in patients with immune-mediated polyneuropathy (130).

Vibration sense was measured with a biothesiometer (Biomedical Instrument, Newbury, Ohio, USA) bilaterally at the ulnar styloid process of the wrist and the medial malleolus of the ankle and compared with reference data (131). The voltage was first increased from 0 volts until the patient was able to feel the vibration stimulus (perception threshold), or until the maximum potential of 50 volts was reached; the voltage was then decreased until the vibration stimulus disappeared (disappearance threshold). The average of these paired measurements, the vibration perception threshold (VPT), was recorded and analyzed. The threshold at which vibration became perceptible increases with age.

3.4.7 Disease-related variables

Complicating events or conditions, such as falls, pressure sores, deep-vein thromboses or disturbances of urinary, bowel or autonomic function, were noted at each evaluation.

The 7-grade Hughes Scale (25) was applied at 2 weeks and 2 years to measure disease severity (grade 0=healthy; grade 1=minor signs or symptoms of neuropathy but capable of manual work; grade 2=able to walk without support of a stick but incapable of manual work; grade 3=able to walk with a stick, appliance or support; grade 4=confined to bed or chair bound; grade 5=requiring assisted ventilation; grade 6=dead). This scale is widely used as an outcome scale in GBS (5, 7, 9, 21-24), even though it has not been tested for validity or reliability.

3.4.8 ADL

Information on dependency in ADL was collected via interviews with the patient. Information was gathered at all evaluation time-points. Information on ADL dependency before GBS onset was collected retrospectively at the 2-week evaluation by asking the patients to fill in the questionnaires with a retrospective view. The Barthel Index (132) is a widely used measure, and was used here for an overall

determination of the patient's ADL-capacity. It comprises 10 items that, in addition to the ability to manage personal hygiene also include mobility and handling stairs. Scores for all items are weighted, with a total score of 100 points (132). The Barthel Index is considered a reliable and valid instrument (133).

Data on independence in personal ADL was collected using the Katz ADL Index (134). It comprises six items that were here dichotomized into dependent or independent: bathing, dressing, going to the toilet, transfer, and continence and feeding. The hierarchical structure of the index was not used in this thesis. Instrumental ADL was assessed by the four items of instrumental ADL in the ADL Staircase (135): cleaning, shopping, transportation outdoors and cooking. These items were graded as dependent or independent. These items of instrumental ADL have been proposed as an extended Katz ADL Index (136), but that index also included the item washing.

3.4.9 Social and lifestyle activities

The frequency of social/lifestyle activities was measured using the Frenchay Activity Index (137). The Frenchay Activity Index consists of two parts pertaining to activities that require some initiative from the person being assessed. The first part consists of 10 items assessing the frequency of activities during the previous 3 months; domestic tasks, leisure activities and outdoor transportation. The second part consists of five items assessing frequency, during the previous 6 months, of outings, gardening, household and/or car maintenance, reading books and gainful work. All items are graded 0-3 with a maximum of 45 indicating a high frequency of social/lifestyle activities.

This questionnaire was conducted via a structured interview at the follow-up evaluations from 2 months and onwards. At the 2-month evaluation, information regarding the 6-month period before GBS onset was collected retrospectively. The Frenchay Activity Index was originally developed for evaluation of stroke patients, and validity in that patient group is considered good (138, 139). It has been used in studies of other neurological disorders (140, 141).

3.4.10 Health-related quality of life

Measurement of the health-related quality of life was performed at all evaluations using the Swedish version (142) of the SIP (54). The patient filled in the SIP at the home visit. The SIP is a generic instrument developed to measure the overall impact of disease. It has been used in many studies – and in this thesis too - as a measure of health-related quality of life. It is considered a valid and reliable instrument (143, 144). The SIP is widely used in neurological studies of multiple sclerosis, polio, muscular dystrophy and stroke (145-148).

The SIP consists of 12 categories with a total of 136 items that each describe an activity or aspect of behaviour or specify a dysfunction. Three categories, Ambulation, Mobility and Body Care and movement, form an aggregated physical dimension. Four categories, Social interaction, Alertness behaviour, Emotional behaviour and Communication, form an aggregated psychosocial dimension. The remaining five categories—Sleep and rest, Eating, Work, Home management and Recreation and pastimes—are independent. Scores can be calculated for each

category, and for the aggregated physical and psychosocial dimensions, with higher scores indicating higher perceived dysfunction. The score range for each category is 0-100. Scores were compared with those from the general Swedish adult population (62).

3.4.11 Coping capacity

Coping capacity, as represented by the concept of sense of coherence, was measured by the 13-item version of the Sense of Coherence Scale (61). The scale has been translated into Swedish (149). The patients filled in the scale at the follow-up evaluations from 2 months and onwards. The 13 items are constructed as statements, which are rated on a Likert-scale from 1 to 7. Reliability and validity are considered good (61, 150). The Scale has been widely used in many settings and patient groups (150). In this study, the correlation between scores on the Sense of Coherence Scale and scores on the SIP was investigated. Comparisons were also made using reference values from the general Swedish adult population (62, 151).

3.4.12 Use of healthcare

In this thesis the environmental factors utilization of healthcare resources, community-based services and technical aids were investigated. Data on the utilization of hospital in- and outpatient care and primary care was obtained for patients recruited at the Karolinska University Hospitals at, Huddinge and Solna, via a computerized registry at Stockholm County Council. In the case of patients recruited at the other six hospitals, data was obtained through the perusal of medical records. Data was collected from the 6-month period before the onset of GBS until 2 years after onset. For analysis of use of healthcare, two sub-groups were formed, independent or dependent in ADL. Dependency in ADL was investigated via the extended Katz ADL-Index (134, 135) retrospectively before GBS onset and thereafter at all the evaluation time-points. Dependency was categorized as less than a full score on the extended Katz ADL Index.

A study-specific protocol was used to collect data on community-based services and other health-related resources for the same time-period: self-reported technical aids in the areas of mobility, personal care and household management; permits for transportation service for disabled persons; community-based home-help service (for personal care, indoor cleaning and washing); community-based day care (for therapeutic and social reasons to the elderly); visits to a chiropodist. Data was collected by interviewing the patients for retrospective data on the period prior to the latest evaluation. The information on technical aids was validated at the home-visits. Supplementary information was obtained from spouses or caregivers. A similar protocol was found feasible in the home environment in Swedish studies of multiple sclerosis and stroke (152, 153).

3.4.13 Patient satisfaction

A patient satisfaction questionnaire used in earlier studies of patients with rheumatoid arthritis (154), stroke (153) and multiple sclerosis (152), was used in a modified version featuring 14 items. These were constructed as statements that the patients were asked to agree or disagree with on a 5-grade Likert scale. The five response

options were dichotomised in the analysis to 3 options, satisfied/ uncertain/ dissatisfied. The statements were each linked to parts of the dimensions of care based on the taxonomy devised by Ware (88). The questionnaire was filled in by the patients at the 6-month, 1-year and 2-year evaluations. In the questionnaire, the patients also had the opportunity to write comments of their own.

3.4.14 Informal help and burden of care

At the 6-month, 1-year and 2-year evaluations after GBS onset, the patients were asked to nominate their principal informal caregiver and to provide an estimate of the time (hours/week) the informal caregiver spent in assisting them in personal and instrumental ADL.

A study-specific questionnaire on the burden of care was presented to the spouses at the 1-year and 2-year evaluations. If the spouse was present during the home-visits, they had opportunity to fill in the questionnaire at that time. Otherwise, it was mailed to the spouse. The questionnaire was developed specifically for the present study and the statements were partly adopted from the SIP (54). It consisted of 12 statements regarding responsibility, social and leisure activities and anxiety about the spouses' health. The headline in the questionnaire was: "Your spouse has fallen ill with Guillain-Barré syndrome. How has this affected you?" Answers were on a Likert scale with three response options, agree, partly agree or disagree with the statement. In the analysis the options agree and partly agree were summarized to agree.

3.5 DATA ANALYSES IN PAPER I-III

In all papers, descriptive statistics were used. Medians and inter-quartile ranges (IQR) have been cited in presentations, together with means and standard deviations (SD). Because the data analyzed were categorical, ordinal or had skewed distributions, non-parametrical statistical methods were primarily used. A p-value less of than 0.05 was considered statistically significant. Data were analyzed using SPSS version 11.0 and 13.0.

In Paper I, the Wilcoxon Signed-Ranks Test and McNemars Test, were used to calculate probability values for changes between the evaluations.

In Paper II, changes between evaluations were tested with the Wilcoxon Signed-Ranks Test. Differences between scores on the SIP and reference values were tested via the Sign Test. Spearman rank-order correlation coefficients have been cited to express correlations between scores on the Sense of Coherence Scale and scores on the SIP.

In Paper III, changes over time regarding the questionnaires were tested via the Wilcoxon Signed-Ranks Test. In part of the analysis, subgroups were formed on the basis of any pre-existing illness or dependency in ADL. Differences between subgroups were tested via the Mann-Whitney Test.

3.6 PARTICIPANTS AND METHOD IN PAPER IV

3.6.1 Participants

At about 2 years after onset of GBS, all the 42 patients who took part in Papers I-III were sent written information about this qualitative study. After one week, they were telephoned and asked about participation, which was based on informed consent. Thirty-five persons agreed to participate. Five persons felt uncomfortable with the interview situation using a tape-recorder and therefore declined. The other two persons did not give a specific reason. Six of the seven persons who declined participation were female, and six were above 65 years old.

3.6.2 Data collection

The author of this thesis (A.F.) conducted all the interviews. The interviews mostly took place in the person's home but a few preferred another setting such as their workplace or local hospital. The interviews were carried out as conversations based on an interview guide with three thematic areas: Experience of onset of GBS, Thoughts regarding the diagnosis and Illness experience during hospital care. Follow-up questions were asked, with the scope and number depending upon how clearly and fully they had narrated the main questions. The interviews were tape-recorded and transcribed verbatim, with pauses and indications of expressions of emotion. The interviews as a whole also included experiences of rehabilitation and the time-period after hospital discharge, but this data is not presented in this thesis.

3.6.3 Data analysis

A qualitative research approach comprising both manifest and latent content analysis (155, 156), was conducted. Content analysis focuses on human communication and is suited to research that involves eliciting meaning, interpretations, consequences and context (155). Each study using content analysis must clarify the procedures, as several methods exist, depending on the purpose of the study and nature of the narrative data (156, 157). Therefore, the analysis started with a pilot study with two interviews to improve the steps of the procedure. This resulted in the following procedure:

1. All the transcribed interviews were read in their entirety to obtain an overall picture.
2. Based on the thematic areas in the interview guide, three content areas (156) emerged in the initial phase of the analysis; Onset of illness, Diagnosis and Illness progress during hospital care. According to Graneheim & Lundman (156), content area can be parts of the text based on theoretical assumptions from the literature, or parts of the text that address a specific topic in an interview guide.
3. The interview texts were divided into meanings units, that is, words and statements related to the same central meaning.
4. The manifest content analysis was applied when the meaning units were condensed (156, 157). These condensed meaning units were kept close to the text but were shortened in length.

5. In next step, each meaning unit was labelled with the content area that it belonged to.
6. The latent content analysis (156) was performed when each condensed meaning unit was interpreted more in-depth by scrutinizing for its latent content, and expressed as preliminary themes. The preliminary themes that related to similar underlying meanings were taken as a sub-theme (156). Sub-themes were then organized into a higher order, so that sub-themes became the building blocks of more comprehensive themes.
7. The credibility or trustworthiness of the results was addressed through investigator triangulation (158), in that all authors took an active part in the analysis of the data. The analysis was discussed in several meetings, leading to in refinement of sub-themes and themes.

The order of presentation of themes in the results reflects the number of statements included in the different themes.

3.7 ETHICAL CONSIDERATIONS

The patients were first recruited for participation in the prospective studies (Papers I-III). All patients received written and verbal information. All patients included agreed to participate in the assessments and could choose to decline further assessments at any time. Great account was taken of the patient's medical status when performing the assessments. Before the start of the qualitative study (Paper IV), it was specifically pointed out in the new written information that participation was voluntary.

Approval for the study, Papers I-III, was obtained through the Regional Ethics Committee of Karolinska Institutet in Stockholm. Paper IV was approved by the Research Ethic Committees at each of the hospitals involved.

4 RESULTS

4.1 CHARACTERISTICS OF PATIENTS IN PAPERS I-III

Baseline characteristics of the 42 patients followed for 2 years are presented in Table 4. The mean age of the patients at GBS onset was 52 years (SD 18); 12 patients (29%) were over 65. Sixteen patients (38%) had one or several pre-existing illnesses at the time of onset. The two patients with a prior history of a neurological disorder had poliomyelitis in childhood, in one case, and stroke, in the other; five of the patients with cardiovascular disorders were under treatment for hypertension. All patients except two were completely independent in ADL before GBS onset. One patient reported dependency in one item of personal ADL, continence, on the Katz ADL Index (134), and one patient reported dependency in instrumental ADL, the item cleaning indoors (136).

Table 4. *Characteristics of patients with Guillain-Barré syndrome (n=42) at disease onset*

Variable	Number of patients
Men/women	24/18
Living with spouse	28
Apartment/detached house	26/16
Swedish/other nationality	35/7
Basic/higher education	12/30
Working or studying/unemployed	24/3
Retired due to age/ illness (or on sick leave)	11/4
Pre-existing illness (N=16)	
Cardiovascular disorder	10
Diabetes mellitus	5
Musculoskeletal disorder	5
Respiratory disorder	2
Neurological disorder	2

Antecedent medical events occurring during the 4 weeks preceding GBS onset, and the use of immunomodulatory treatments and mechanical ventilation during the course of GBS are presented in Table 5. The choice of treatment was determined at the participating hospitals; treatment was started a median of 6 days (inter-quartile range [IQR] 3-12) from onset of symptoms. At the time of onset, one patient was being treated with corticosteroids for rheumatoid arthritis. The median time on ventilator support was 20 days (range 5-287) for the patients that required who treatment.

In the comparison of hospital sub-groups, Karolinska University Hospital at Huddinge versus the other seven hospitals, it was revealed that treatment was initiated at similar time points in the subgroups, median 8 days at Huddinge and median 6 days at the other hospitals. There was no significant difference between mean age at onset, 53 years (SD 20) at Huddinge and 51 years (SD 15) at the other hospitals. The two subgroups were also comparable with regard to age- and sex distribution, pre-existing illnesses, antecedent medical events, use of immunomodulatory treatments and disease severity (Table 5).

***Table 5**. Medical events occurring during the 4 weeks preceding the onset of Guillain-Barré syndrome, and the use of immunomodulatory treatments and mechanical ventilation during the course of disease*

	Number of patients (%)		
	All patients (n=42)	Huddinge (n=22)	Other hospitals (n=20)
Antecedent medical events, total	30 (71)	15 (68)	15 (75)
Respiratory infection	14 (34)	5 (23)	9 (45)
Gastric infection	8 (19)	4 (18)	4 (20)
Other infections	5 (12)	5 (23)	0
Surgery	1 (2)	1 (4)	0
Vaccination	1 (2)	0	1 (5)
Pregnancy (third trimester)	1 (2)	0	1 (5)
Immunomodulatory treatment, total	36 (86)	18 (82)	18 (90)
Intravenous immunoglobulin (IVIg)	25 (59)	17 (77)	8 (40)
Plasma exchange	5 (12)	0	5 (25)
IVIg and plasma exchange	4 (10)	0	4 (20)
IVIg or plasma exchange and Corticosteroids	2 (5)	1 (5)	1 (5)
Mechanical ventilation	9 (21)	3 (14)	6 (30)

4.2 DISABILITY: IMPAIRMENT OF BODY FUNCTION, ACTIVITY LIMITATION AND PARTICIPATION RESTRICTION (PAPERS I AND II)

Scores on the MMSE at the 2-week evaluation were within the normal ranges, median 29 (IQR 28-30). Most improvement in muscular speed and strength occurred within the first year, especially in the first 6 months. For some individuals, though, recovery with continuing improvement was seen between the 1-year and 2-year evaluation. The recovery is illustrated clearly in the case of with facial function, with residual deficits still present at 2 years after GBS onset. At 2 weeks, 38% had some weakness in facial function, and that decreased to 12 % at 2 years. Function of the mouth was most affected at all evaluations. Similar results were obtained for other motor functions (Table 6).

Table 6 presents the results of measurements of body function and activity. Residual deficits of motor function were evident at 2 years in 8 patients (19%) who had sub-maximum muscle score in the upper body and 23 (55%) in the lower body; 13 patients (31%) had subnormal grip strength (112); 11 patients (26%) had subnormal gait speed (118); 15 patients (36%) fell short of a maximum score on the Berg Balance Scale; 18 patients (43%) fell short of a maximum score on the LMCA. Impairment in motor performance was seen at 2 years, as 9 patients (21%) could not run 10 meters, 12 patients (29%) could not jump 5 times leaving the floor and 17 patients (40%) could not squat without support.

Regarding sensory function, 11 patients (26%) had VPT values higher than normal in the ankles at 2 years after GBS onset, compared with age- and sex-matched reference data (131), although four of them had diabetes mellitus or a cardiovascular disorder (Table 6). Impairment of other sensory functions was stable over the study-period. Patients reporting paraesthesia decreased but not significantly. At 2 years, 20 patients (48%) reported paraesthesia and 9 patients (21%) had impaired sensory function in

their feet although 6 of them also suffered from diabetes mellitus or a cardiovascular disorder.

The number of patients reporting pain decreased significantly between the 2-week and 2-month evaluations. At 2 weeks after onset 30, patients (71%) reported GBS-related pain, at 2 months 21 patients (50%) and at 2 years, 14 patients (33%) still reported having GBS-related pain during the preceding week. Fatigue was reported by 16 patients at the1-year and 17 patients (40%) at the 2-year follow-up.

Table 6. *Results of measurements of body function and activity (n=42, unless otherwise indicated)*

Variable (range of scores)	Median (inter-quartile range)				
	2 weeks	2 months	6 months	1 year	2 years
MRC Muscle score (0-150)	89 (64-108)	132 (99-142)*	144 (129-149)*	147 (136-150)*	148 (139-150)*
Grip strength, kPa					
Right hand	18 (0-36)	55 (27-86)*	76 (45-103)*	80 (53-108)*	84 (61-108)
Left hand	20 (0-40)	52 (22-78)*	71 (45-99)*	78 (54-103)*	78 (58-113)
Timed 10 meter walking, m/s	0 (0-0.7)	1.1 (0.3-1.5)*	1.5 (1.0-1.9)*	1.6 (1.2-2.0)*	1.7 (1.2-2.0)
Nine-Hole Peg Test, pegs/s					
Right hand	0.2 (0.1-0.4)	0.5 (0.3-0.7)*	0.6 (0.5-0.7)*	0.6 (0.5-0.7)	0.6 (0.5 0.7)
Left hand	0.2 (0-0.4)	0.5 (0.4-0.6)*	0.6 (0.4-0.6)*	0.6 (0.5-0.6)	0.6 (0.5-0.6)
Bergs Balance Scale (0-56)	4 (0-38)	53 (28-56)*	56 (50-56)*	56 (51-56)	56 (50-56)
LMCA					
Arms (0-114)	93 (58-106)	111 (103-114)*	114 (111-114)*	114 (114-114)*	114 (114-114)
Legs (0-72)	24 (5-59)	72 (45-72)*	72 (69-72)*	72 (69-72)*	72 (68-72)
Mobility (0-27)	9 (0-24)	26 (24-27)*	27 (26-27)*	27 (26-27)*	27 (26-27)
Rapid move. (0-24)	13 (9-18)	24 (19-24)*	24 (23-24)*	24 (23-24)	24 (22-24)
Passive mov. (0-104)	104 (95-104)	104 (102-104)	103 (104-104)	104 (104-104)	104 (104-104)
PEF, l/min	378 (305-494) [n=36]	421 (350-528) [n=39]*	436 (356-524) [n=40]	433 (352-530) [n=41]	433 (352-533) [n=41]
Vibration perception threshold, Voltage					
Right ankle	24 (10-18)	18 (11-34)*	16 (11-26)*	14 (12-33)	14 (11-36)
Left ankle	33 (14-50)	25 (12-44)*	15 (10-30)*	13 (10-24)	14 (11-27)

*= Significant change between evaluations at 2 weeks compared to 2 months, 2 months compared to 6 months, 6 months compared to 1 year and 1 year compared to 2 years.

There were few GBS-related complications that persisted over the whole study-period. The number of patients reporting autonomic dysfunction decreased over time, 71% of patients at 2 weeks and 7% at 2 years. The patients throughout the study reported excessive sweating. Similarly, urinary and bowel disturbance were reported

by 40% and 52% of patients respectively at 2 weeks, but this resolved over time for almost all. Reported falls occurred mostly before admission to hospital. The patients who reported falls at the follow-up evaluations all had decreased scores on the Berg Balance Scale. Disease severity as measured by the Hughes Scale is listed in Table 7.

Table 7. *Results of GBS disease severity as measured via the Hughes scale*

Grade	Number of patients (%)	
	2 weeks	2 years
0	0	17 (41)
1	2 (5)	16 (38)
2	10 (24)	5 (12)
3	5 (12)	1 (2)
4	16 (38)	3 (7)
5	9 (21)	0
6	0	0

Most improvement on assessments of ADL occurred during the first 6 months, but a continuing improvement took place for up to 2 years in some patients. Scores on the Katz ADL Index and the Barthel Index increased significantly between evaluations during the first 6 months after onset, and on the extended ADL Index during the first year. Table 8 depicts ADL and working status during the study-period. Five patients were dependent in both personal and instrumental ADL at 2 years after GBS onset, and a further six patients in instrumental ADL. At 2 years, 2 of the 19 patients who returned to work worked only part-time as a result of residual deficits of GBS. Seven patients were on sick leave or had retired due to residual deficits of GBS, while the other two patients were on sick leave because of another illness.

Scores on the retrospective assessment on the Frenchay Activity Index before the onset of GBS compared to scores at 2 years displayed no significant change (Table 8). However, 10 patients (24%) had a decreased score of more than five points (10%) at 2 years compared to before GBS onset.

Twenty-eight patients were living with a spouse at the start of the study, a figure that did not change during the study-period. One patient was forced to change housing during the study-period because of residual deficits of GBS.

Table 8. *Results of extended Katz ADL Index, working status, Barthel Index and Frenchay Activity Index; before onset of Guillain-Barré syndrome, at 2 weeks and at 2 years after the onset*

	Numbers (%)					
	Before onset	2 weeks	2 months	6 months	1 year	2 years
Dependent in personal ADL	1 (2)	32 (76)	11 (26)	7 (17)	6 (14)	5 (12)
Dependent in instrumental ADL	1 (2)	41 (98)	30 (71)	12 (29)	12 (29)	11 (26)
Working or studying	24 (57)	0	4 (10)	17 (41)	19 (45)	19 (45)
Unemployed	3 (7)	0	0	0	0	0
Retired because of age	11 (26)	11 (26)	11 (26)	11 (26)	11 (26)	14 (33)
Retired because of illness	3 (7)	3 (7)	3 (7)	3 (7)	3 (7)	3 (7)
Sick leave	1 (2)	28 (67)	24 (57)	11 (26)	9 (21)	6 (14)
	Median (inter-quartile range)					
Barthel Index (0-100)	100 (100-100)	40 (18-81)	100 (83-100)	100 (100-100)	100 (100-100)	100 (100-100)
Frenchay Activity Index (0-45)	32 (29-35)		16 (5-24)	30 (19-34)	31 (24-36)	32 (25-37)

4.3 HEALTH-RELATED QUALITY OF LIFE AND SENSE OF COHERENCE (PAPER II)

Results from the SIP are presented in Figure 2. The physical dimensions of the SIP showed significant improvement in the first year after onset, while the psychosocial dimensions improved significantly for up to 6 months. Higher scores were seen at all evaluations in the categories Home management, Work and Recreation and pastime on the SIP indicating decreased health-related quality of life. Scores on the SIP at 2 years were significantly higher only for the aggregated score in the physical dimension relative to reference data from the general Swedish adult population (159). The most frequently affirmed items on the SIP were items of ambulation and body movement.

Median scores on the Sense of Coherence Scale are presented in Figure 3. Scores did not significantly change over the study-period. However, not all individual scores were stable over time and in 12 patients (29%) scores deviated by more than 10%. Mean scores were higher than reference scores from the general adult population in which mean scores ranged from 61 to 65 (151, 159). There were significant correlations between higher scores on the Sense of Coherence Scale and lower scores on the overall score on the SIP at the 1-year follow-up (r=-0.34) and the 2-year follow-up (r=-0.31).

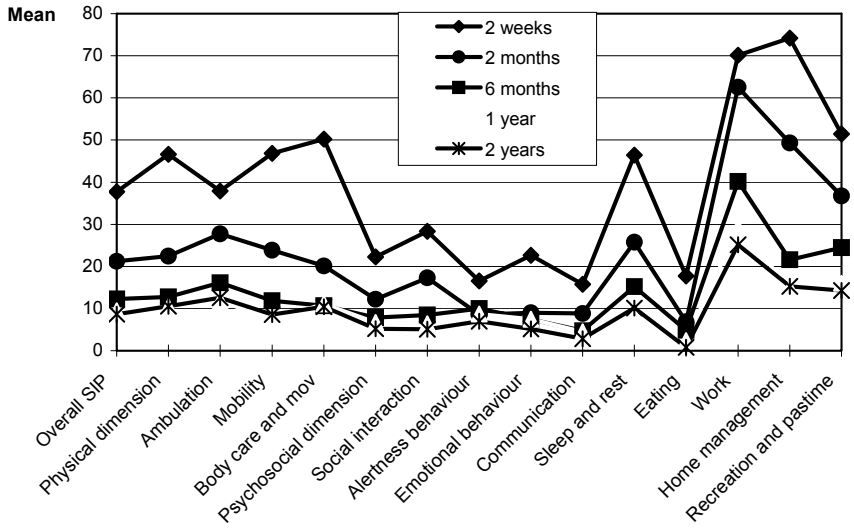

Figure 2. *Mean score on the Sickness Impact Profile at all evaluations. The category Work does not include patients retired because of age. Higher scores indicate decreased health-related quality of life. The range of possible scores is 0-100.*

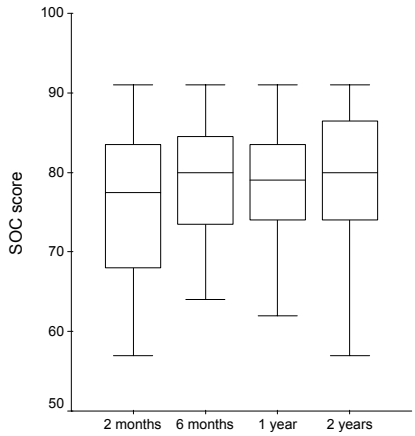

Figure 3*. Score on Sense of Coherence Scale (range of possible scores: 13-91) at evaluations from 2 months to 2 years. The box indicates the range between the 25th and 75th percentiles; the line marks the 50th percentile (median). Capped bars indicate the 10th and 90th percentiles.*

4.4 USE OF HEALTHCARE AND PATIENT SATISFACTION (PAPER III)

The duration of in-patient hospital stay was less than 3 months for 31 patients (74%), 3-6 months for 7 patients (17%) and more than 6 months for 3 patients (7%). The mean hospital in-patient stay was 82 days (SD 99). All but one patient was treated as hospital in-patients. The sub-group consisting of patients that were dependent (N=11)

in ADL was significantly older (p=0.03) than the independent patients (N=31), mean age 62 years versus 48 years. Patients with persistent dependency in ADL had both significantly longer in-patient hospital stays and more days of out-patient rehabilitation than the independent patients.

The proportions of hospital in-patient stay are presented in Figure 4. All but 2 patients visited an emergency department at the time of onset of GBS. Rehabilitation accounted for the major part of the healthcare use after GBS.

Out-patient care during the 0-24 months after GBS onset is presented in Figure 5. Visits to a physical therapist accounted for 80% of total number of primary care visits. Thirty-three patients (79%) underwent out-patient rehabilitation or physical/occupational therapy during these 2 years, a mean of 68 days/visits (SD 52) for these patients. Five further patients underwent only in-patient rehabilitation. Visits to physicians included both primary care and out-patient hospital care, and during the 2 year study-period all patients had visited a physician a mean of 13 visits (SD 13) per patient. The patients with a pre-existing illness accounted for significantly more visits to physicians compared to those without a pre-existing illness.

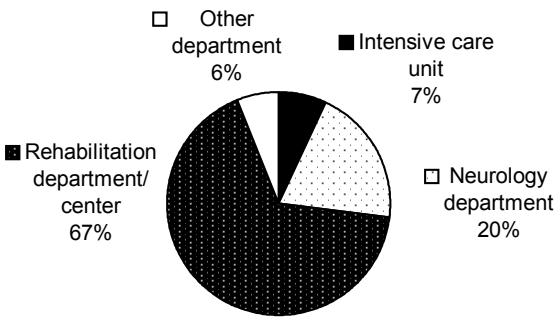

Figure 4. *Hospital in-patient length of stay from 0-24 months after onset of Guillain-Barré syndrome, proportion of days (n=42)*

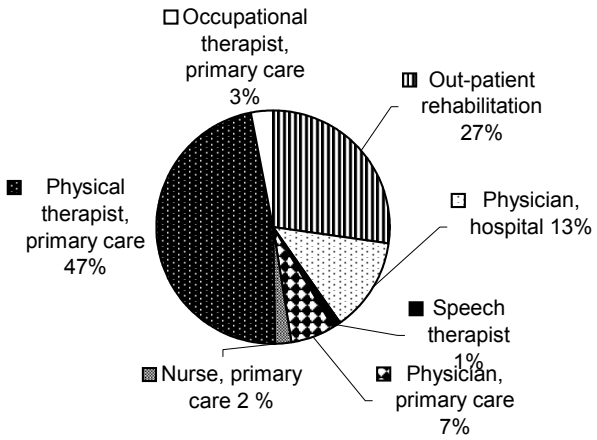

***Figure 5**. Out-patient care during 0-24 months after onset of Guillain-Barré syndrome, proportion of visits (n=42)*

During the first 0-6 months after GBS onset, 33 patients (79%) required technical aids and in the period 7-24 months 20 patients (48%). Technical aids were assistive devices to increase independency in ambulation and ADL. At 2 years after onset, 13 patients (31%) still needed technical aids, and 8 of them were aged 65 years or more. Ten patients had community-based service in their home for some period during the study-period, which continued for 3 patients (7%) at 2 years after onset. The majority of patients (67%) received a permit for health-related transportation during the study-period, mostly during the first 6 months after onset. Nine patients (21%) had treatment for their feet from a chiropodist, and most of them had a pre-existing illness.

Patient satisfaction with the care received was generally high. Reported patient satisfaction with the different dimensions of care varied at 6 months between 66-98% of patients satisfied with care, and both at 1 year and 2 years between 61-100%. Figure 6 presents information on the number of satisfied patients in seven of the dimensions. Least satisfaction was expressed with the dimensions Cost of care and Information at all points in time. Eleven patients wrote comments in the questionnaire regarding aspects with which they were dissatisfied. Most comments regarded the amount of physical therapy or rehabilitation received and lack of follow-up visits to professionals.

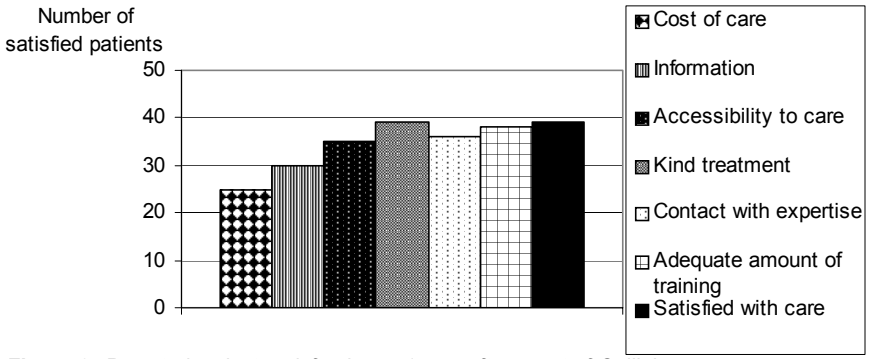

Figure 6. *Reported patient satisfaction at 1 year after onset of Guillain-Barré syndrome (n=42)*

4.5 INFORMAL HELP AND BURDEN OF CARE (PAPER III)

Several patients received informal help from a member of the family with managing personal and instrumental ADL, from 38% at 6 months to 26% at 2 years. There was a large individual variation, within the range of 1-168 hours/week, in the amount of time spent on informal help. Some patients only needed occasional hours while others received help from a family member almost round the clock. For a few patients this was out of choice, in preference to receiving community-based home-help service. The major shares of hours/week were spent in the first months after GBS onset.

Nineteen spouses (68%) answered the study-specific questionnaire on burden of care. Scores on the questionnaire did not change significantly between 1 year and 2 years after GBS onset (Table 9). The burden of care was more evident in statements in the questionnaire that were of a psychosocial nature. For the spouses of patients with ADL-dependency, a higher burden of care was expressed in all but two statements.

Table 9. *Responses on the questionnaire to spouses of patients with Guillain-Barré syndrome (n=19)*

Statements in the study-specific questionnaire	1 year Agree/Disagree	2 years Agree/Disagree
I have to help my spouse with transfers and body care	5/14	4/15
I pay more attention to the needs of my spouse	13/6	14/5
I express concern over the health of my spouse	15/4	13/6
I take more responsibility for household chores now	12/7	9/10
I take more responsibility for the family	13/6	12/7
I have cut down on the time spent visiting friends and relatives	9/10	8/11
I spend less time on social and community activities now	9/10	7/12
My choice of leisure activities has changed	7/12	10/9
I spend less time on hobbies and recreational activities now	8/11	8/11
I get sudden frights	7/12	9/10
I have difficulty with activities involving concentration and thinking	7/12	5/14
I lie down more often during the day in order to rest	4/15	4/15

4.6 FALLING ILL WITH GUILLAIN-BARRÉ SYNDROME (PAPER IV)

4.6.1 Characteristics of participants

The mean age of the 35 persons at onset of GBS was 50 years (SD 17, range 20-78), and 5 persons were above 65 years of age. Twenty-two persons were male. Twenty-five persons (71%) lived with a spouse both at time of onset of GBS and at the time of the interview. During the acute phase, 30 persons (86%) received immunomodulatory treatment. Nine persons (26%) were ventilator-treated between 5-287 days.

Before GBS onset, one person was dependent in parts of instrumental ADL, the item cleaning indoors (134, 136). At the time of the interview at 2 years after onset, four persons were dependent in items of both personal (134) and instrumental ADL (136), and four further persons in only instrumental ADL.

4.6.2 Descriptions of the experiences of the participants

Table 10. *Experiences during the initial phase, content areas and themes*

Onset of illness • *Incomprehensible, prolonged, increasing deterioration* • *Frightening, rapid onset*
Diagnosis • *Confidence in recovery* • *Worry and shock* • *Felt too ill to care about the diagnosis*
Illness progress at hospital • *Fear and insecurity in a vulnerable situation* • *Distinct, hopeful improvement* • *Alarmingly slow recovery* • *Strange bodily sensations* • *Experiences of mental sensations*

In the content area Onset of illness, two themes were found, with variations in sub-themes. The onset of illness was described as either an *Incomprehensible, prolonged, increasing deterioration* or as a *Frightening, rapid onset* (Table 10). The persons with prolonged onset described a start with puzzling sensations in the body that in the beginning could disappear for hours before coming back. A startling weakness in the feet, legs and hands was prominent and the body increasingly became a stranger. There was a growing awareness that something must be wrong, together with a fear of a having a better-known disease such as multiple sclerosis. The other theme was the *Frightening, rapid onset.* The persons described a sudden weakness with difficulty in walking. For some individuals, the rapid onset only took hours before they needed to seek medical care. Fear and shock at helplessness was expressed, as the control of the body was suddenly lost. If there was any difficulty with breathing, a fear of dying was described.

In the content area Diagnosis, three themes were found dominated by one of them, the *Confidence in recovery* (Table 10). The persons relied heavily on the reassurance of a positive prognosis, and held on to it as a “lifebuoy” during this confusing and

troubling period. They chose to focus on the information that most people recover well, and were unable at that time to confront a situation in which they would not recover. Frank information about the course of disease made many persons feel secure, even when the paralysis increased. Another theme relating to the diagnosis was *Worry and shock* about falling victim to an unfamiliar disease as well as fear of residual deficits. A couple of patients described that they *Felt too ill to care about the diagnosis* or the prognosis. This was described as lack of energy, of being overwhelmingly tired and dazed.

The content area Illness progress during hospital care included several themes, with a variety of sub-themes (Table 10). For most of the individuals, deterioration continued with the illness peaking during hospital care. The feeling of *Fear and insecurity in a vulnerable situation* was evident, and expressed as the sensation of becoming more and more paralysed and dependent. Decreased body functions were accompanied by helplessness and shame, especially when the person needed help with hygiene. The progression in it self was worrying, the feeling of not knowing when it would stop. About half of the persons experienced a life-threatening state of health. All ventilator-treated individuals talked of fear of dying when they experienced lack of breath and feelings of being abandoned.

The majority of the persons described a *Distinct, hopeful improvement* with a rapid and steady course. Once the course of disease had turned, functions returned one by one, reinforcing hope. Leaving the wheelchair, was for several persons, a huge step forward, as was the ability later to walk without a technical aid. In contrast, even in this early phase of hospital care some individuals expressed doubts of the recovery when relating to an *Alarmingly slow recovery*. The concern of a prolonged recovery was becoming a realization and a fear of residual problems was evident, especially in the case of continued facial paralysis, or not being able to walk again.

Most of the persons described experiences of *Strange, bodily sensations*, such as an unreal body, intense pain and annoying numbness. The body was described as dead and unusable. These unpleasant sensations caused disturbed sleep for many individuals. The ventilator-treated persons all talked vividly about the nauseating and often disgusting experience of suctioning of mucus, an experience that stuck in their memories. *Experiences of mental sensations* were also common. Half of the ventilator-treated persons were plagued by hallucinations. These were horrible and made them anxious and fearful. Several persons felt dazed and exhausted during this early phase at hospital.

5 DISCUSSION

5.1 METHODOLOGICAL CONSIDERATIONS

5.1.1 Design and procedure

This thesis comprises both quantitative and qualitative studies in order to provide a comprehensive description of how GBS may affect the individual, from an objective and subjective view. The prospective quantitative studies (Papers I-III) were longitudinally designed, following patients for 2 years. The strength of performing repeated assessments over time is that it enables the course of disease to be charted. It also creates the opportunity for both participants and investigator to ask follow-up questions. Multiple assessments were performed to elucidate the overall experiences and effect of GBS on an individual and his surroundings.

The patients' homes were selected as the primary place for assessment and interviews in order to provide a relaxing atmosphere and increase compliance. Compliance was good, in that only two patients withdrew during the 2-year study-period for Papers I-III, and 83% of patients agreed to participate in the interview-based study.

The baseline evaluations were performed 4-42 days after the onset of symptoms. This wide range arose for several reasons. In some cases, it took several days before the patients were reported to the coordinator. Another reason was that the patients' medical status prohibited testing during the planned interval and evaluations had to be re-scheduled. The next follow-up point was as early as 2 months after onset and, with a longitudinal perspective, this compensated for the varying time-points for the 2-week evaluation. Some patients were severely ill in the acute phase and considerable attention was paid to their medical status when performing the measurements.

The qualitative study describes the individual experiences of people falling ill with GBS. The interviews were performed 2 years after onset of GBS, a time-point chosen for two reasons. The first was because time would have elapsed to enable the participants to reflect on their experiences. The second reason was practical - the interview could be coordinated to take place at the 2-year follow-up. In a couple of cases, the interviews were re-scheduled for another visit, as the patients were tired.

The method content analysis was chosen for analysis of the interviews, since this is a suitable method for analysing descriptions of experiences. Both manifest and latent content analyses were performed. The manifest part was first performed during analysis of the obvious visible components, and then the latent part in order to interpret the underlying meaning of the interview text.

5.1.2 Internal validity

In this thesis, attempts to achieve internal validity have been made. Polit & Hungler (160) suggest several threats to the internal validity. Those relevant to studies in this thesis are selection, testing and instrumentation. Regarding any possible selection bias, it was found that the characteristics of the study group were similar to other recent population-based studies (6, 7, 9, 10, 23, 35). The fatality rate was nil, suggesting that although severely affected patients might not be reported, the proportion of patients with severe GBS requiring mechanical ventilation is

comparable to other population-based studies. Similar to our findings, Cheng et al have reported low mortality rates in a recent Swedish study (6). These findings, taken together, support our contention that the investigated study group is an unselected sample that may be considered representative of the population of GBS patients in Sweden. A drawback, however, is the uneven inclusion coverage of patients from the eight study-hospitals.

The design of repeated testing might pose a threat in the use of questionnaires, as the participants might not report changes in order to present a more positive or negative recovery. To avoid this effect, the scores on the questionnaires performed earlier were not revealed to the participants beforehand. The issue of instrumentation may also represent a bias, as there were two persons performing the evaluations. To minimize this risk, concordance in ratings was assessed and both investigators were familiar with the physical tests and questionnaires. The results could also be biased by less accurate measurements, as a result of the patients becoming fatigued or, bored or because of learning-effect from earlier measurements. During the evaluations, pauses were inserted if needed by the patients. The patients were also able to choose the time and setting of the evaluations.

Triangulation is a key concept in validity (161). The term is mostly used in qualitative studies but is also relevant to quantitative studies in the comparison and analysis of diverse ways of looking at the same phenomenon. Patton (158) suggests different kinds of triangulation: the use of multiple and different methods, sources and analysts. In this thesis, both qualitative (Paper IV) and quantitative (Papers I-III) methods were used to investigate how GBS might affect individuals. Different sources were used by taking the perspective of the person with GBS (Paper IV) and those of the spouses (Paper III). In addition to the author of this thesis, two further researchers were engaged in the analysis of the interviews (Paper IV).

Altogether, the internal validity was considered good for the papers in this thesis, as bias regarding selection, measurements and analysis was limited.

5.1.3 External validity

The results of the quantitative studies (Papers I-III) may be generalized to other groups of patients with GBS. However, the small number of participants is a limitation and prohibits investigation of causality. The relatively low incidence of GBS is a difficulty in obtaining larger samples of study-participants. Another recruitment protocol engaging more hospital staff might have increased the enrolment of patients.

The participants in the qualitative study (Paper IV) encompassed individuals with a wide range of experiences of the course of GBS. The large number of sub-themes conveys rich descriptions of experiences. The relatively large number of participants and the variety of disease severity increase the transferability of the results to other persons with GBS. The majority of the individuals who declined to participate in an interview were aged 65 years or more, and that lessens the transferability of the experiences to older persons with GBS.

5.1.4 Measures

When the studies included in this thesis were being planned no disease-specific measures existed, other than the Hughes Scale (25). In recent years, a couple of measuring instruments for polyneuropathies have been presented, which have been developed or revised via subsequent psychometric testing. These include measures for fatigue (48), grip strength (112), sensory function (130), disability score (162, 163) and walking (164). Measures for Papers I and II were chosen that would offer a comprehensive assessment of functions where patients with GBS supposedly could be affected. The measures also had to be usable when performing tests in the patient's home. It was not possible to perform a pilot study to evaluate the feasibility of the measures or patient recruitment, in view of the relatively low incidence of GBS, but that would have increased the strength of the studies.

Overall, the chosen measuring instruments were found to be suitable for follow-up of recovery after GBS, but a couple of instruments will be discussed. Ceiling-effects were notable early in the study-period with use of the LMCA and the Berg Balance Scale. These two instruments were developed for stroke patients and geriatric patients respectively, and our finding may not be surprising. These measuring instruments may not be suitable for follow-up of GBS patients with a more widely varied age range. The LMCA was supplemented by three items of motor performance; running 10 meters, jumping leaving the floor and squatting without support. The item of running was chosen since Rees et al (23) reported that about 30% of GBS patients could not run at 1 year after onset. However, since the item of running was performed in the patient's home, this item tested the ability to perform a running motion without a double stance.

Obvious and anticipated ceiling effects were also evident in the measures of ADL. Personal and Instrumental ADL are important activities that need to be assessed after the onset of GBS, but also to be supplemented by other activity measurements. It is important to include both measures of activity and participation in outcome studies to provide an answer as to whether the functional health of the patients has improved. The Barthel Index still remains a corner-stone of activity measurement (165), and it is recommended for measuring physical disability (166). For GBS, disease-specific measuring instruments of physical disability are now available (163, 167). But to measure global disability, other generic measuring instruments - such as the Barthel Index and the Functional Independence Measure - may still be necessary (166).

The Frenchay Activity Index, used in Paper II to measure social/lifestyle activities, was originally validated as an activity index in stroke (139). Turnbull et al (168) suggest that items specific to younger people such as sports must be incorporated in the Frenchay Activity Index for it to be valid in non-stroke populations, which concurs with the experiences documented in this thesis.

Testing of muscle strength was an indicator of recovery of body function over time for the study-group, as significant changes were seen throughout the 2 year-period. However, in the case of individual patients with fast recovery, ceiling effects were evident early in the course of disease. The Medical Research Council Scale (109) comprises six grades from 0 to 5, but concentrate on the three lowest grades (165). Manual muscle testing has been criticized for being insufficiently accurate when high sensitivity is required (169). An alternative could be to use a hand-held myometer that also provides a ratio measure. The Medical Research Council Scale was chosen

because it has been used in other studies of GBS (110) and because no instruments are needed.

Both pain and fatigue were measured using a VAS. The VAS has the advantage of being a robust, sensitive, reproducible method of expressing pain severity, but some patients may have difficulty in grasping the metaphor of the continuum (107). The same experience was found during the home visits, as some patients needed explanations before filling in the VAS. It is suggested that a numerical scale might be easier for patients to complete (107). After the studies in this thesis were started, Merkies et al (48) in 1999 validated the Fatigue Severity Scale (170) for patients with polyneuropathies. The Fatigue Severity Scale may therefore be recommended instead of a VAS for measuring fatigue. Reference scores and cut-off points are available for the Fatigue Severity Scale (171).

In Paper I it was decided that measures of sensory function should be included, since other studies have shown that sensory residual deficits contribute to disability in GBS (57). Sensory function measures included paraesthesia, pinprick, light touch and vibration. In 2001, Merkies et al (130) included these measurements in a sensory scale for immune-mediated polyneuropathies and showed good validity and reliability. The measures of paraeasthesia, pinprick and light touch are crude since they do not specify the amount of sensory dysfunction, but were easy to perform during the home-visits.

5.2 REFLECTIONS ON THE RESULTS

5.2.1 Disability

The results of Papers I-II show that nine patients, 21%, had a poor outcome at 2 years after GBS onset, as measured by the widely used Hughes Scale (25). Grade 2 or worse indicated a poor outcome, as seen in several other studies. This result is in line with the prospective study by Chio et al (7) and several other studies presented in Table 1. Noticeably, two of these nine patients were independent in ADL but were incapable of returning to previous work and performing manual labor. This shows the limitation of using a single scale to describe disability, and instead several scales may be used.

From the perspective of body function, 55% of the patients had sub-maximum overall muscle strength at 2 years after GBS onset, and affected sensory function, mainly paraesthesia, was detected in 52%. In many patients, these impairments did not prohibit activities or restrict participation. Affected sensory function was seen in the majority of patients with a poor outcome according to the Hughes Scale and in about half of the ADL-dependent patients. An impairment that may have a profound effect on the patients' social life and participation is facial-muscle weakness. In Paper I, it is reported that 12% of the patients still had decreased facial function 2 years after onset. Few studies have investigated long-term facial function, but De Jager et al (41) reported that 9% of patients had persistent facial paralysis 2-24 years after onset of severe GBS. It is probably a combination of factors that contribute to disability. A small study by Lennon et al (172) found that muscle weakness was a major cause of persistent disability, but psychosocial factors and fatigue also played a part (172). Impairment measures explained a substantial element of disability in a study by Merkies et al (173), but only half of the variance in handicap. The correlations between body function, activity and participation in patients with GBS need to be

studied further, in order to optimize the rehabilitation. It is important to know when and at which level of functioning different steps in rehabilitation need to be performed for the patients to achieve the maximum level of activity and participation.

From the perspective of activity and participation, 11 patients (26%) were dependent in personal and/or instrumental ADL at 2 years and seven of them had, as mentioned, a grade 2 or worse on the Hughes Scale. The other four patients had a pre-existing illness that perhaps, together with residual deficits after GBS, made them dependent in instrumental ADL. The community-based service provided the necessary part of the help for three patients, supplemented by help from relatives, and a family member provided the help for the fourth patient. Research on activity limitations after GBS is limited, but there are a couple of Dutch studies. Using a questionnaire 3-6 years after onset, Bernsen et al (51) found 44% of patients had altered their leisure activities from sports and activities requiring physical effort to more sedentary activities. In another study, also by Bernsen et al (50), 52% of patients reported altered leisure activities one year after GBS onset. However, this patient group consisted of patients all unable to walk in the onset phase. We found less number of patients with activity limitations, maybe because of an unselected sample of patients. In Paper II, 10 patients (24%) reported decreased scores on the Frenchay Activity Index compared to before GBS onset. The impact on activity and participation after GBS need to be studies further, but these studies taken together indicate that frequency of activities may be reduced, and that may have a negative impact on the person's lifestyle.

From the perspective of work, seven patients, 17%, were on sick leave or had retired due to illness at 2 years after onset because of GBS-related deficits. Three of these patients were unable to return to previous work because of fatigue and residual facial paresis, and the other four because of weakness in arms or legs. The perspective of work has gained attention the recent years. An Italian study (37) reported 20% had to change jobs while a Danish study found that 26% of patients had experienced a negative effect on their work situation (21). A Dutch study by Bernsen et al (51) reported higher numbers, with 38% of working patients having to change jobs, but this was in a group of patients all of whom had severely reduced walking ability in the onset phase. Our findings are in agreement with the population-based Italian and Danish studies. It is important to incorporate the issue of work in the rehabilitation of patients with GBS. The amount and in which way residual deficits may reduce ability of working needs to be studied further.

Overall, the findings in Papers I and II show that about 25% of patients in this group of patients with GBS had disability at 2 years after GBS onset. The numbers of patients vary slightly according to the chosen outcome perspective. Impairment of body functions such as reduced muscle strength was seen in a further 25% of patients. The findings in this thesis are comparable with those of other recent prospective or cross-sectional studies (6, 7, 21, 23, 32, 35, 37, 43, 57) (Table 1 and Table 2). There are studies that present both smaller and larger numbers of patients with disability but these studies differ methodologically from Papers I and II. A larger uncertainty often exists in studies based on a retrospective design that relies on medical records. Several studies are performed on selected groups of patients with GBS (22, 44), often patients who were severely affected in the acute phase, and these studies show higher figures than the heterogeneous group in Papers I and II. No other study presents the same level of detailed information on body function, activity and participation as in the papers in this thesis. Most studies presented in Table 1 and Table 2 use only the Hughes Scale to investigate function, and other studies do not use a specific

measurement. No study found has used the term disability according to the ICF. It is preferably to use the ICF as it provides a standard language and framework for descriptions of health. Using the term disability according to the ICF enables comparison between studies.

In Papers I-III, the patients were followed up with repeated measures during the 2-year follow-up period. Significant improvements up to the 6-month evaluation were noted in several of the measures such as the Nine-Hole-Peg Test, the Berg Balance Scale, vibration perception, the Barthel Index and the Katz ADL Index. In measures of grip strength, walking speed, motor capacity and the physical dimension of the SIP, significant improvements were seen up to 1 year. Only the muscle score displayed significant improvement up to 2 years after GBS onset. This information suggests that recovery mostly happens the first 6 months after GBS onset and that after 1 year recovery is limited. Rehabilitation therefore needs to be started early. The information on expected recovery may also be important for the planning of future assistance in ADL, housing and work.

As the number of study participants in Papers I and II only comprised 42 patients, the scope for performing multiple regression analysis is limited. However, some interesting associations were found. All patients who reported falls showed lesser scores on the Berg Balance Scale, and this was noticeable at all evaluations. The Berg Balance Scale as a predictor of falls has been proposed in other studies (122). More than half of the patients, 59%, who reported fatigue had, at most, minor motor impairments. A similar finding was reported by Merkies et al (48), where a majority of patients who had regained normal strength reported severe fatigue.

5.2.2 Fatigue and pain

A review study by Chaudhuri and Behan (47) stated that chronic fatigue is a typical symptom of neurological diseases. Post-GBS fatigue is associated with central fatigue that is characterized by a feeling of constant exhaustion (47). Experiences of post-GBS fatigue have received attention in recent years. Merkies et al (48) found fatigue to be an important cause of dysfunction, in that as many as 80% of patients 3-6 years after GBS reported suffering from fatigue. These patients had other residual physical symptoms that may explain the higher number of patients compared to the 40% found in Paper I at 2 years after onset. Fatigue seemed to be consistent over time as the same patients but one reported fatigue both at 1 year and 2 years after onset (Paper I). Research on the prevalence of fatigue in the general population is limited, but Lerdal et al (171) reported as many as 23% having high fatigue in a sample of the general Norwegian population. High fatigue was defined by Lerdal et al (171) as a score of 5 or higher on the Fatigue Severity Scale. This rather high figure needs to be reproduced in other studies on general population. The dysfunction of post-GBS fatigue needs to be studied further, in order to understand and provide treatment for this disabling phenomenon.

The findings on pain in the present study concur with the findings by Moulin et al (46), in that pain subsided over the first 2 months after clinical onset. Moulin et al (46) also reported that dysesthetic extremity pain tended to linger, but resolved for the majority before 6 months after onset. In Paper I, only pain intensity was investigated but it is also relevant to investigate the nature of the pain. Our results from 14 patients (33%) reporting pain at 2 years after GBS onset are higher than the results found in a

survey (174) of chronic pain in the general population in Europe, where 19% reported chronic pain. Our findings suggest that GBS-related pain may linger for up to 2 years. However, pain might be studied more in detail using other measures than VAS. Location of pain, nature as well as intensity is important to further investigate in order to optimize treatment.

5.2.3 Aspects of health-related quality of life and sense of coherence

Several factors may impact patients' view of their health-related quality of life. Apart from personal factors, there are residual physical and psychosocial deficits, such as pain, fatigue and physical weakness that may have an impact on the health-related quality of life. The SIP has been used in one earlier study of patients with GBS (57). That study found that scores were significantly higher 3-6 years after onset, compared to the results from a healthy control group, indicating decreased health-related quality of life. The SF-36, which is also a widely used generic instrument, has been used in two studies of GBS (21, 58). Both studies found reduced scores in the physical domains of the SF-36. High dysfunction was found in the SIP category Recreation and pastime (Paper II). The adverse impact on leisure activities agrees with the results found on the Frenchay Activity Index in Paper II. GBS may have a negative long-term effect on performing leisure activities, which in turn may lower the health-related quality of life.

Health-related quality of life may be linked to coping capacity, as indicated by the significant but low correlations found between scores on the SIP and scores on the Sense of Coherence Scale (Paper II). This result accords with a Swedish study on a sample from the general population (62). Scores on the Sense of Coherence Scale were higher than found in other studies on a general population. A study on patients with the neurological disorder multiple sclerosis reported similar high scores (126). In the past, scores on the Sense of Coherence Scale were anticipated to be stable, but recent studies report that scores decrease with onset of disease and increasing age (175). Scores varied by more than 10% in 29% of patients in Paper II, which could be a reaction to GBS as a life stressor event. Similar to this finding, Snekkevik et al (176) reported stable median Sense of Coherence scores over time after multiple traumas, but unstable individual scores.

5.2.4 Use of healthcare and patient satisfaction

In Paper III, it was found that the Swedish pattern of GBS care is characterized by the use of emergency and in-patient services - 95% of patients - as well as the predominant use of health resources for rehabilitation. Data on in-patient hospital stays in Paper III accorded with a Swedish study by Jiang et al (79), which reported a mean in-patient hospital stay of 86 days. Comparing utilization of healthcare resources between countries is difficult, in view of different health care and financial reimbursement systems. Zelig et al (177) reported 24 patients with severe GBS where 46% required hospitalization for more than 3 months, compared to the findings in Paper III where 26% had in-patient hospitalization for more than 3 months. Rehabilitation, either as in- or out-patient care, accounted for the major part of care. This information is not surprising but it stresses the importance of rehabilitation to this patient group. The subgroup of patients of an older age and/or with a pre-existing illness and persistent ADL-dependency showed a higher degree of utilization of all healthcare.

The majority of patients in this study were satisfied with their care (Figure 6). This could be because the patients felt more taken care of as a result of participating in a study. Both their physical and psychosocial health was monitored repeatedly over the 2 years. The level of patient satisfaction on this study was, however, comparable with that shown in a Swedish study on stroke patients (153). Lower patient satisfaction was reported in a study on MS (152), perhaps because of the unpredictable and progressive course of that disease. The dissatisfaction found mainly centred on information and finances, and there were similar findings in the stroke study on costs of care, and the MS study on information and access to care. The findings of Papers III and IV show similar results in that the patients describe a need of more information on GBS. This could be resolved by verbal and written disease-specific information during hospital stay and follow-up visits. Even though we found high satisfaction overall with care, it is important to continue to evidence-base the different parts of rehabilitation.

5.2.5 Informal care-giving and the burden of care

The proportion of patients, 26%, still receiving help from an informal caregiver 1-2 years after onset, was surprisingly high. A study of patients with multiple sclerosis showed that 20% were receiving informal help from others (152) but fewer hours per week than the GBS patients in Paper III. Perhaps the study protocol for where the patients with GBS were asked to report the number of hours was not rigorous enough. Validation by the informal caregiver would have increased the certainty of the result. Another explanation could be that patients with residual disability after GBS do not receive the community service they need, perhaps because the prognosis is over-optimistic.

The uncertainty about the course of GBS may cause distress and anxiety to family and relatives during the onset phase and during the first year after onset. Bernsen et al (77) reported that 90% of the relatives were seriously worried in the first period after GBS onset. Responses on the questionnaire in Paper III to the spouses of patients with persistent ADL-dependency reflect a burden of care and heightened concern and responsibility. In a study of spouses of patients with stroke, it was found that spouses of patients with low ability in self-care were dissatisfied with several aspects of their life situation, such as leisure and daily occupations (178). The burden of care may be relieved by routinely provided information and increased attention from medical professionals. Bernsen et al (77) also reported the experience that information to relatives to patients with GBS is insufficient.

5.2.6 ICF

The ICF was used as a conceptual framework to describe functioning. As pointed out elsewhere, most of the studies referred to have not used the terminology of the ICF, which make comparison of results sometimes difficult. The chosen measuring instruments covered body function and activity well. Participation was less well covered, as only parts of the Frenchay Activity Index could be regarded to measure participation. For a more comprehensive description of functioning after GBS, measures of participation should be performed. The Sense of Coherence Scale was regarded as a personal factor, since the concept of sense of coherence includes

resources available for a person to cope with life stressors. Patient satisfaction and health-related quality of life are not included in the ICF classification.

5.2.7 Falling ill with Guillain-Barré syndrome

This qualitative study encompasses a wide range of experiences of falling ill with GBS. The findings suggest that the onset of GBS is characterized by an incomprehensible prolonged deterioration or a frightening, rapid paralysis. The majority of the persons were given a positive prognosis when diagnosed. Few individuals expressed anxiety or concern over the diagnosis with fear of having to endure a long recovery period. During the bewildering days of paralysis, this positive prognosis acted as a life buoy for many. In situations where security and health are threatened, it is natural to focus on hope for recovery, a phenomenon also seen in a stroke study (63). In the first weeks after the diagnosis, hope intensified as body functions started to return. In GBS, as in stroke (63, 64), hope is an important feature of the early recovery phase because there is a potential for rapid recovery.

Some persons expressed disappointment that the hospital staff did not inform them that their recovery would take long time and probably would be incomplete. They continued to hope for a full recovery and felt betrayed by the hospital staff. The individuals with facial paresis distinctly expressed a fear of residual deficits, fearing that this social stigma would be permanent. GBS is in general an unfamiliar disease, which increases the importance of the information delivered by hospital staff (65). The persons with an expected prolonged recovery should be identified and psychosocial support may be included early in the care and rehabilitation program.

The persons experienced a variety of bodily sensations. Individuals with severe paralysis described the body as '*unreal*'. The feeling of detachment from the body is also described in stroke-victims (64). Dissociation from the body and limited ability to act were effects of the paralysis found in the persons with GBS. In a study by Johansson et al (179), severely ill patients have similarly described this bodily experience. Other bodily sensations were sleep deprivation, pain and constipation. All of these were major problems that interfered with the patients' general health and recovery and need to be addressed by hospital staff.

Hallucinations were a common experience for the ventilator-treated individuals. This is in line with other research on intensive care where nightmares, disorientation and unreal experiences are associated with fear (180-182). Anxiety and disorientation were also found to be common in other studies of intensive care for GBS patients (66, 67), where loss of communication was the most stressful condition in these studies. Intubation entailed mucus suctioning that many subjects described as a very unpleasant and sometimes horrible experience. Some persons with GBS, as well as other diseases, may need to discuss their stay at intensive care in order to understand their feelings and experiences.

5.2.8 Future studies

In this never-ending field of research, new questions always arise after completion of a study and in the encounter with clinical practice. No longitudinal study has been found that follows patients for more than 2 years. For further knowledge of the

duration of possible recovery in GBS, there is a need for extended longitudinal studies.

Investigation of causality and associations between the components in the ICF is relevant to optimizing rehabilitation, to determine when and where certain rehabilitative steps should be taken. This has not yet been studied within the scope of GBS.

Different aspects of dysfunction after GBS need to be further studied in order to provide optimized care and rehabilitation. Fatigue - impact and treatment - have only recently gained attention and this disabling phenomenon is a possible subject of further study.

Although not within the scope of this thesis, it is notable that the evidence for rehabilitation treatments, including physiotherapy, is scarce. Studies are needed in this area to establish the appropriate exercise regimes for both acute and recovery phases. Multi-centre studies might be needed to enable enough patients to be included.

In the qualitative interview study, the focus was on the onset of GBS and experiences of the initial period after onset. Further studies on experiences during rehabilitation and later on living with residual deficits are needed in order to identify the need for support during those phases. Repeated interviews with the same persons would also be helpful in exploring the coping processes during the course of disease.

6 CONCLUSIONS

The results of this thesis provide information on the course of GBS and how the disease can affect individuals. To physical therapists and other medical personnel, the findings may have implications in terms of planning of rehabilitation and caring interventions.

In this study-group of 42 patients with GBS from 8 hospitals in Sweden, GBS-related disability was extensive at 2 weeks after the onset. During the first 6 months after GBS onset, the primary recovery of body functions and activity occurred. Recovery leveled out generally between 6 months and 1 year after GBS onset. Rehabilitation must therefore start early, and the prognosis for recovery can be determined according to the degree of recovery at 6 months. During the period from 1 year to 2 years, continuing recovery was evident in a few patients. These patients need to be identified in order for them to receive long-term rehabilitation.

Disability was seen in about 25% of patients with GBS at 2 years after onset. Another 25% of patients had residual deficits that did not influence functioning, or only to a minor extent. These numbers concur with those of other studies and should be included in the disease-specific information to patients and relatives, if the patients are to have realistic expectations.

Impairment was somatically widespread at 2 years; it may persist beyond that time point. Investigation of fatigue followed by suitable treatment should be included in the rehabilitation program.

The impact of GBS on ADL, social activities and health-related quality of life was extensive at 2 weeks after the onset and it persisted at the 2-year follow-up despite significant improvements over time. GBS can have widespread impact in several life areas over time and this suggests that health professionals need to work from a broadly based, long-term perspective when treating patients with this disorder.

Overall rehabilitation accounted for a major part of the healthcare use after GBS. Patients were generally satisfied with their care, but dissatisfaction was expressed regarding cost of care and information at all time-points. The lack of information could be made good via oral and written disease-specific information in the acute phase, but also recurrent information later in the course of GBS.

A burden of care with heightened responsibility was evident for spouses of patients with persistent ADL-dependency. This requires further analysis, but stresses the it importance to incorporate the immediate family in the care and rehabilitation

The findings of the qualitative study suggest that the onset of GBS is characterized by an incomprehensible prolonged deterioration or a frightening rapid onset of paralysis. Falling ill with GBS involves a hope for recovery that for many patients is reinforced by the steady pace of recovery. In contrast, an alarmingly slow recovery becomes a reality for some patients early in the course of the disease. These patients should be identified and psychosocial support may be included early in the care and rehabilitation program.

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Impairment in Guillain–Barré syndrome during the first 2 years after onset: a prospective study

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Abstract

Objectives: To provide a comprehensive description of impairment in patients with Guillain–Barré syndrome (GBS) in Sweden during the first 2 years after disease onset.
Methods: In this prospective multi-centre study, 42 patients, mean age 52 years, were evaluated at 2 weeks, 2 months, 6 months, 1 year and 2 years. Evaluations made use of validated, reliable measures of muscle strength, grip strength, finger dexterity, balance, facial-muscle function, respiratory function, gait, motor performance and sensory examination, and included patients' owns assessments of pain, fatigue and paraesthesia.
Results: Mechanical ventilation was required in 21% of patients. At 2 weeks, 1 year and 2 years after GBS onset: 100%, 62% and 55% of patients had submaximal overall muscle strength; 98%, 38% and 31% subnormal grip strength; and 38%, 14% and 12% affected facial-muscle function. At the same time points, 62%, 10% and 7% of patients were unable to walk 10 m independently; and affected sensation was detected in 93%, 55% and 52%.
Conclusions: Recovery occurred mainly during the first year after onset. At 2 years, motor impairment and sensory impairment were each still detectable in more than 50% of patients. We conclude that residual impairment is significant, somatically widespread and, likely, persistent.

Keywords: Guillain–Barré syndrome; Impairment; Follow-up study; Outcome; Multi-centre study; Muscle function; Sensory function

1. Introduction

Guillain–Barré syndrome (GBS) is an inflammatory, demyelinating polyradiculoneuropathy of acute or subacute onset. Early clinical features include symmetrical limb weakness, absent tendon reflexes, cranial nerve palsies, disturbances of autonomic function, paraesthesia and pain [1,2]. Outcome in GBS was once thought to be favourable in the majority of patients; however, as recent studies have shown, in patients with severe GBS, recovery is often incomplete more than 2 years after onset [3–5]. Assess-

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ment of outcome in GBS has often been performed using a single scale, with an emphasis on walking ability [6]; such a scale might not be comprehensive enough since GBS is a disorder characterized by simultaneous defects in several physiological systems. Rather in GBS, a full battery of sensitive outcome measures might be needed, particularly for assessment over time [2]. The aim of the present study was to employ such a battery of measures, with a view to providing a comprehensive description of impairment in patients with GBS in Sweden during the first 2 years after onset.

2. Material and methods

2.1. Subjects

This study was conducted prospectively from April 1998 to December 1999. Patients were recruited from eight hospitals in central Sweden with a collective catchment area of about 3.6 million inhabitants: Huddinge University Hospital, Karolinska Hospital, Uppsala Akademiska Hospital, Örebro University Hospital, Västerås Hospital, Falun Hospital, Borås Hospital and Sahlgrenska University Hospital. Approval for the study was obtained through the Regional Ethics Committee of Karolinska Institutet in Stockholm. All patients, above 18 years of age, diagnosed with GBS according to the criteria of Asbury and Cornblath [7] were given information about the study and asked about participation. Informed consent was obtained from each patient entering the study. Of 49 patients initially recruited, 5 were not enrolled to the study—for 2 patients, the original diagnosis was revised to chronic inflammatory demyelinating polyradiculoneuropathy, and 3 patients were adjudged to suffer from other diseases—and 2 enrolled patients declined further contact during follow-up. Thus, a total of 42 patients were enrolled and followed for 2 years (Table 1). At 1 year, one of the authors (R.P.), a clinical neurologist, confirmed the patients' diagnoses based on medical records.

Possible selection bias was estimated by comparing the recruited study group with all patients entered in the national Hospital Inpatient Registry (HIR) with a discharge diagnosis of GBS. Data from the HIR revealed that, during the study period, 124 patients over 18 years of age were discharged from the eight study hospitals with a diagnosis of GBS; 46 (37%) of these patients were initially recruited to the study, while conversely, 3 patients included in the study were not found in the HIR. Comparisons were also made within the followed-up study group, between the subgroup of patients recruited at Huddinge University Hospital (HUH) (n=22) and the subgroup recruited at other hospitals (n=20); the subgroup from HUH included 86% of possible GBS patients registered in the HIR, and the subgroup from the other hospitals included 23% of possible HIR-registered GBS patients.

Table 1
Characteristics of patients with Guillain–Barré syndrome (GBS) (n=42) at disease onset

Variable	Number of patients (or other, indicated value)
Age, mean±standard deviation (range), years	52±18 (20–80)
Men/women	24/18
Living with spouse	28
Apartment/detached house	26/16
Swedish/other nationality	35/7
Basic/higher education	12/30
Working or studying/unemployed	24/3
Retired due to age/due to illness (or on sick leave)	11/4
Independent in Katz Extended ADL before GBS onset	41
MMSE, median (inter quartile range) [maximum=30]	29 (28–30)
Previous medical history (n=16) of	
Cardiovascular disorder	10
Diabetes mellitus	5
Musculoskeletal disorder	5
Respiratory disorder	2
Neurological disorder	2

ADL=activities of daily living; MMSE=Mini-Mental State Examination.

2.2. Assessment procedure

Baseline evaluations were performed 2 weeks (±1 week) after the clinical onset of symptoms and follow-up evaluations 2 months (±2 weeks), 6 months (±1 month), 1 year (±2 months) and 2 years (±2 months) after onset. Two of the authors, both physical therapists, performed the evaluations, independently of one another (A.F. 73% of evaluations, and U.E. 27%). Concordance in ratings was assessed, both prior to start of the study and throughout its course, and adjudged to be satisfactory. For the most part, baseline evaluations were performed at the local hospital, and follow-up evaluations, to ensure compliance, in the patients' homes. Each evaluation took about 1 h to complete.

2.3. Measures

The level of independence in activities of daily living (ADL) before GBS onset was assessed retrospectively using the Katz Extended ADL [8]. At baseline, demographic characteristics—as well as information concerning medical history, antecedent events occurring during the 4 weeks preceding GBS onset, and the use of immunomodulatory treatments and mechanical ventilation—were collected from medical records and interviews with the patients. Cognitive function was assessed using the Mini-Mental State Examination (MMSE) [9] at the 2-week evaluation, or when convenient for the patient. Measures were chosen to detect forms of impairment, as described in the domain of "Body Function and Structure" in the World Health Organization's International Classification of Functioning, Disability and Health (ICF) [10], supposedly present in patients with GBS

[2]. Complicating events or conditions, such as falls, pressure sores, deep-vein thromboses (DVT) or disturbances of urinary, bowel or autonomic function, were noted at each evaluation.

Muscle strength in designated movements was tested bilaterally and scored on a 0–5 grading scale [11], and scores were summed to a total muscle score. The following movements were tested: in the upper body, shoulder abduction, elbow flexion and extension, wrist flexion and extension, thumb abduction and neck flexion and extension; and in the lower body, hip flexion, extension and abduction, knee flexion and extension, foot flexion and extension and toe extension. Grip strength was measured with a Vigorimeter [12], using the medium-sized balloon; the highest value from three trials was recorded and compared with reference data [12]. For ages 20–64 years were values below 89 kPa for men and 72 kPa for women and for ages above 65 years were values below 74 kPa for men and 58 kPa for women regarded as subnormal [12]. Finger dexterity was measured using a modified Nine Hole Peg Test (9HPT) [13]; time was recorded from the moment the patient touched the first peg until all holes had been filled with pegs one-handed. Balance was tested using the Bergs Balance Scale (BBS) [14], according to which 14 balance activities are assessed in both the sitting and standing position, each item is scored 0–4. Gait speed (m/s) was measured during a fast-paced 10-m walk and compared with reference data [15]. Walking aids were allowed. Gait speeds below 1.5 m/s for men and 1.4 m/s for women [15] were regarded as subnormal. The 0–5 grading scale, the Vigorimeter, 10-m walking and the 9HPT were all found to be sensitive measures of recovery in an earlier study of immune-mediated polyneuropathies [16]. The single scale by Hughes [6] was applied at 2 weeks and 2 years for comparison (grade 0=healthy; grade 1=minor signs or symptoms of neuropathy but capable of manual work; grade 2=able to walk without support of a stick but incapable of manual work; grade 3=able to walk with a stick, appliance or support; grade 4=confined to bed or chair bound; grade 5=requiring assisted ventilation; grade 6=dead).

Motor performance was tested using the following subscales from the Lindmark Motor Capacity Assessment (LMCA) [17], with each item scored 0–3: active performance with the arms and legs, mobility, rapid movements and passive movements. Because ceiling effects were expected, the BBS and LMCA were supplemented with three independent measures of motor performance at the 6-month, 1-year and 2-year evaluation: running 10 m, jumping in the air five times and squatting without support. Movements performed using the muscles of the face, wrinkling the forehead, shutting the eyes, puckering the lips, smiling and yawning, were graded as either affected or not affected. Respiratory function, peak expiratory flow (PEF), was tested in the sitting position with a handheld spirometer (Micro Spirometer, Micro Medical Instruments, Rochester, UK). The highest value from three trials was recorded and compared with reference data [18]. Vibration sense was measured with a biothesiometer (Biomedical Instrument, Newbury, OH, USA) bilaterally at the ulnar styloid process of the wrist and the medial malleolus of the ankle and compared with reference data [19]. The voltage was first increased from 0 V until the patient was able to feel the vibration stimulus (perception threshold) or until a maximum potential of 50 V was reached; the voltage was then decreased until the vibration stimulus disappeared (disappearance threshold). The average of these paired measurements, the vibration perception threshold (VPT), was recorded and analysed.

Pain was self-rated using a visual analogue scale (VAS) 100 mm in length, with “no pain” and “unbearable pain” as opposite extremes; patients were asked to rate pain related to GBS experienced during the preceding week. Since many patients were found to complain of fatigue, self-rated fatigue was added to the evaluation at 1 year; fatigue experienced during the preceding week was rated using a VAS with “no fatigue” and “worst imaginable fatigue” as opposite extremes. Paraesthesia, numbness, tingling or hyperaesthesia in the extremities or face was graded by the patients themselves as either present or absent. Sensory function was assessed in the hands and feet by pinprick and light touch and was graded as either affected or not affected.

2.4. Statistical analysis

Because the analysed data were categorical, ordinal or had skewed distributions, non-parametrical statistical methods, the Wilcoxon signed ranks test and McNemars test were used to calculate probability values for changes across evaluations. A p-value less than 0.05 was considered statistically significant. Medians and inter-quartile ranges (IQR) have been cited in the presentations of the data.

3. Results

Baseline characteristics of the 42 patients followed for 2 years, 24 men and 18 women, are presented in Table 1. The mean age of the patients at GBS onset was 52 years; 12 patients were over 65. All patients except one (who needed help with cleaning) were independent in ADL before GBS onset. Sixteen patients (38%) had a medical history at the time of onset. The two patients with a prior history of a neurological disorder had poliomyelitis in childhood, in one case, and stroke, in the other; five patients with cardiovascular disorders were under treatment for hypertension.

Antecedent events occurring during the 4 weeks preceding GBS onset, and the use of immunomodulatory treatments and mechanical ventilation during the course of GBS, are presented in Table 2, both for all patients and for the subgroups. The choice of treatment was decided upon at the participating hospitals; treatment was started a median of 6 days (IQR 3–12) from the clinical onset. At the time of onset, 1 patient was receiving corticosteroids as treatment

Table 2
Events occurring during the 4 weeks preceding the onset of GBS and the use of immunomodulatory treatments and mechanical ventilation during the course of GBS

	Number of patients (%)		
	All patients (*n*=42)	HUH (*n*=22)	Other hospitals (*n*=20)
Antecedent event			
Respiratory infection	14 (34)	5 (23)	9 (45)
Gastric infection	8 (19)	4 (18)	4 (20)
Other infections	5 (12)	5 (23)	0
Surgery	1 (2)	1 (4)	0
Vaccination	1 (2)	0	1 (5)
Pregnancy (third trimester)	1 (2)	0	1 (5)
Total	30 (71)	15 (68)	15 (75)
Immunomodulatory treatment			
Intravenous immunoglobulin (IVIg)	25 (59)	17 (77)	8 (40)
Plasma exchange (PE)	5 (12)	0	5 (25)
IVIg and PE	4 (10)	0	4 (20)
IVIg or PE and corticosteroids	2 (5)	1 (5)	1 (5)
Total	36 (86)	18 (82)	18 (90)
Mechanical ventilation	9 (21)	3 (14)	6 (30)

HUH=Huddinge University Hospital.

for rheumatoid arthritis. Treatment was initiated at similar time points in the subgroups, a median of 8 days from clinical onset at HUH and a median of 6 days at the other hospitals. The median time on ventilator support was 20 days (range 5–287) in the entire study group. There was no significant difference between the subgroups with regard to mean age at onset, which was 53 years (S.D. 20) at HUH and 51 years (S.D. 15) at the other hospitals.

Results of measurements of physical performance are presented in Table 3. The muscle score increased significantly over time, in both the upper and lower body, during the 2 years of follow-up; at 2 years, 8 patients (19%) had a submaximal muscle score in the upper body and 23 (55%) in the lower body. Values on grip strength increased significantly during the first year after GBS onset, but not thereafter; at 2 years, 13 patients (31%) had subnormal grip strength, compared with reference data [12]. Time to perform the 9HPT decreased significantly bilaterally during the first 6 months after onset; at 2 weeks, nine patients (21%) could not insert any of the pegs, a tally that decreased to one patient (2%) at 2 years. Score on the BBS increased significantly during the first 6 months after onset; at both 1

Table 3
Results of measurements of physical performance, at each evaluation time point, in patients with Guillain–Barré syndrome (*n*=42, unless otherwise indicated)

Variable (range of possible scores)	Median (inter quartile range)				
	2 weeks	2 months	6 months	1 year	2 years
Muscle score					
Upper body (0–70)	52 (42–62)	66 (57–68)	70 (64–70)	70 (69–70)	70 (70–70)
Lower body (0–80)	31 (18–57)	66 (43–75)	75 (64–80)	77 (69–80)	78 (69–80)
Grip strength, kPa					
Right hand	17.7 (0–36.3)	54.9 (27.0–86.3)	76.5 (45.1–103.0)	80.4 (53.0–107.9)	84.4 (60.8–107.9)
Left hand	19.6 (0–40.2)	52.0 (21.6–77.5)	70.6 (44.6–99.3)	78.5 (54.4–103.0)	78.5 (57.9–112.8)
Nine Hole Peg Test, pegs/s					
Right hand	0.2 (0.1–0.4)	0.5 (0.3–0.7)	0.6 (0.5–0.7)	0.6 (0.5–0.7)	0.6 (0.5–0.7)
Left hand	0.2 (0.0–0.4)	0.5 (0.4–0.6)	0.6 (0.4–0.6)	0.6 (0.5–0.6)	0.6 (0.5–0.6)
Bergs Balance Scale (0–56)	4 (0–38)	53 (28–56)	56 (50–56)	56 (51–56)	56 (50–56)
Gait, m/s	0.0 (0.0–0.7)	1.1 (0.3–1.5)	1.5 (1.0–1.9)	1.6 (1.2–2.0)	1.7 (1.2–2.0)
Lindmark Motor Capacity Assessment					
Arms (0–114)	93 (58–106)	111 (103–114)	114 (111–114)	114 (114–114)	114 (114–114)
Legs (0–72)	24 (5–59)	72 (45–72)	72 (69–72)	72 (69–72)	72 (68–72)
Mobility (0–27)	9 (0–24)	26 (24–27)	27 (26–27)	27 (26–27)	27 (26–27)
Rapid movements (0–24)	13 (9–18)	24 (19–24)	24 (23–24)	24 (23–24)	24 (22–24)
Passive movement (0–104)	104 (95–104)	104 (102–104)	103 (104–104)	104 (104–104)	104 (104–104)
Peak expiratory flow, L/m	378 (305–494) [*n*=36]	421 (350–528) [*n*=39]	436 (356–524) [*n*=40]	433 (352–530) [*n*=41]	433 (352–533) [*n*=41]
Vibration perception threshold, V					
Right wrist	13 (10–18)	10 (7–12)	9 (6–12)	9 (6–11)	9 (6–11)
Left wrist	13 (10–18)	9 (7–12)	8 (6–10)	9 (7–10)	8 (7–10)
Right ankle	24 (13–50)	18 (11–34)	16 (11–26)	14 (12–33)	14 (11–36)
Left ankle	33 (14–50)	25 (12–44)	15 (10–30)	13 (10–24)	14 (11–27)

year and 2 years, 15 patients (36%) fell short of a maximum score on the BBS. At 2 weeks, 26 patients (62%) were unable to walk 10 m, at 2 months 8 (19%), both at 6 months and 1 year 4 (10%) and at 2 years 3 patients (7%). Gait speed increased significantly during the first year after onset; at 2 years, 11 patients (26%) still had subnormal gait speed, compared with age- and sex-matched reference data [15]. The number of patients with submaximal total muscle scores, subnormal grip strength, submaximal BBS scores and subnormal gait speed is presented for all evaluation time points in the Fig. 1. Using the single scale by Hughes [6]; at 2 weeks, grade 0, n=0; grade 1, n=2 (5%); grade 2, n=10 (24%); grade 3, n=5 (12%); grade 4, n=16 (38%); grade 5, n=9 (21%); grade 6, n=0; at 2 years, grade 0, n=17 (40%); grade 1, n=16 (38%); grade 2, n=5 (12%); grade 3, n=1 (2%); grade 4, n=3 (7%); grade 5 and 6, n=0.

Scores on the LMCA subscales arms, legs and mobility increased significantly during the first year after onset and score on the subscale rapid movements increased significantly during the first 6 months. At 2 years, 9 patients (21%) had a submaximal score on the subscale arms; 12 (29%) on the subscale legs; 13 (31%) on the subscale mobility; 12 (29%) on the subscale rapid movements; and 10 patients (24%) on the subscale passive movements. The number of patients who were unable to run 10 m decreased during follow-up, from 14 (33%) at 6 months to 10 (24%) at 1 year and 9 (21%) at 2 years. At 6 months, 20 patients (48%) were unable to jump 5 times, compared to 11 (26%) at 1 year and 12 (29%) at 2 years. The number of patients who were unable to squat without support decreased during follow-up, from 26 (62%) at 6 months to 20 (48%) at 1 year and 17 (40%) at 2 years. Values on PEF increased significantly between the 2-week and 2-month evaluations; thereafter, however, most patients displayed stable values within the normal range [18]. (At each evaluation time point, at least 1 patient was unable to close his lips around the spirometer.) The VPT decreased significantly, in both ankles, during the first 6 months; at 2 years, 11 patients (26%) had supranormal VPT values in the ankles, compared with age- and sex-matched reference data [19], although four of them had diabetes mellitus or a cardiovascular disorder.

Table 4
Facial-muscle function in patients with Guillain–Barré syndrome (n=42), at each evaluation time point

Movement	Number of patients (%) with affected function				
	2 weeks	2 months	6 months	1 year	2 years
Wrinkling the forehead	12 (29)	6 (14)	4 (10)	3 (7)	3 (7)
Shutting the eyes	13 (31)	7 (17)	4 (10)	2 (5)	1 (2)
Puckering the lips	15 (36)	9 (21)	7 (17)	6 (14)	5 (12)
Smiling	15 (36)	8 (19)	5 (12)	5 (12)	4 (10)
Yawning	11 (26)	6 (14)	4 (10)	3 (7)	3 (7)
Total	16 (38)	9 (21)	7 (17)	6 (14)	5 (12)

The proportion of patients displaying signs of facial-muscle paresis decreased from 38% at 2 weeks to 12% at 2 years; the most frequently affected functions were the ability to pucker lips and the ability smile (Table 4). The number of patients reporting pain decreased significantly between the 2-week and 2-month evaluations, but not thereafter; at 2 years, 14 patients (33%) still reported having experienced pain related to GBS during the preceding week and 17 patients (40%) reported having experienced fatigue (Table 5). The number of patients reporting paraesthesia decreased over time, however not significantly; the presence of paraesthesia was most prominent in the lower extremities at all evaluation time points. At 2 years, 6 patients (14%) experienced numbness in both upper and lower extremities, 2 (5%) in only the upper extremities and 9 (21%) in only the lower extremities; 8 patients (19%) experienced tingling in both upper and lower extremities, 2 (5%) in only the upper extremities and 3 (7%) in only the lower extremities. The number of patients with impaired sensation decreased over time; at 2 years, 9 patients (21%) had impaired sensation in the feet although 6 of them suffered from diabetes mellitus or a cardiovascular disorder.

No patient developed pressure sores or suffered a DVT during follow-up. The number of patients reporting a disturbance of urinary function decreased over time, from

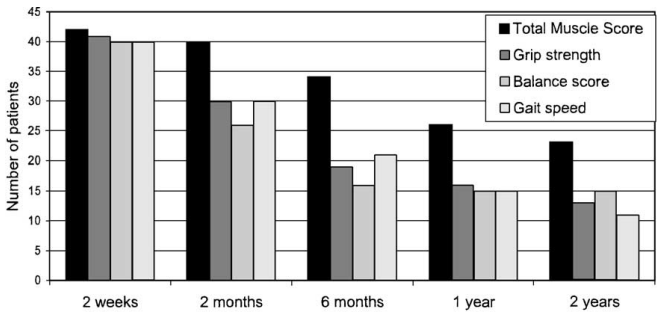

Fig. 1. Number of patients with submaximal total muscle scores, subnormal grip strength, submaximal Berg Balance Scale scores and subnormal gait speed at each evaluation time point.

Table 5
Self-rated pain, fatigue and paraesthesia, and impaired sensation upon examination in patients with Guillain–Barré syndrome (n=42), at each evaluation time point

Variable	Number of patients (%)				
	2 weeks	2 months	6 months	1 year	2 years
Pain	30 (71)	21 (50)	15 (36)	16 (38)	14 (33)
Fatigue				16 (38)	17 (40)
Numbness					
Upper extremities	23 (55)	15 (36)	8 (19)	10 (24)	8 (19)
Lower extremities	28 (67)	21 (50)	15 (36)	15 (36)	15 (36)
Face	4 (10)	2 (5)	2 (5)	2 (5)	1 (2)
Tingling					
Upper extremities	22 (52)	11 (26)	9 (21)	10 (24)	10 (24)
Lower extremities	22 (52)	16 (38)	15 (36)	14 (33)	11 (26)
Face	4 (10)	2 (5)	2 (5)	0	1 (2)
Hyperaesthesia					
Upper extremities	6 (14)	6 (14)	1 (2)	1 (2)	1 (2)
Lower extremities	7 (17)	6 (14)	4 (10)	4 (10)	2 (5)
Face	2 (5)	1 (2)	1 (2)	1 (2)	0
Impaired sensation					
Hands	14 (33)	9 (21)	3 (7)	2 (5)	1 (2)
Feet	23 (55)	23 (55)	15 (36)	11 (26)	9 (21)

17 (40%) at 2 weeks to 4 (10%) at 2 months, 1 (2%) at 6 months and 1 year and 0 at 2 years. Similarly, the number of patients reporting a disturbance of bowel function also decreased over time, from 22 (52%) at 2 weeks to 9 (21%) at 2 months, 8 (19%) at 6 months, 3 (7%) at 1 year and 1 (2%) at 2 years. Autonomic dysfunction was reported by 30 patients (71%) at 2 weeks, 21 patients (50%) at 2 months, 8 patients (19%) at both 6 months and 1 year and 3 patients (7%) at 2 years. Excessive sweating was the predominant form of autonomic dysfunction throughout the follow-up, followed by orthostatic dizziness. Falls at the time of GBS onset (in most case, before admission to hospital) were reported by 15 patients (36%), 13 of who reported symptoms indicative of autonomic disturbance at the 2-week evaluation. At 2 months, 9 patients (21%) had fallen at least once since the previous evaluation; at 6 months, 3 patients (7%); and at 1 year and 2 years, 1 patient (2%). At each evaluation, all patients reporting falls had submaximal scores on the BBS.

4. Discussion

In the present study, we used a comprehensive battery of outcome measures with a prospective design, to provide a thorough description of the changes of impairment in GBS during the first 2 years after onset. Significant improvements in motor function were seen mainly during the first year after GBS onset since in the second year only muscle score increased significantly. However, individual patients improved during the second year in all the measures of motor function—muscle strength, grip strength, balance and gait—as at 1 year 28% of patients displayed impairment and at 2 years 24% of patients. At 2 years, more than half of the patients still had some form of sensory impairment, and one fourth still had supranormal VPT values.

The proportions of patients in the entire study group experiencing noteworthy antecedent events and requiring mechanical ventilation were similar to those reported in recent population-based studies [20–22]. In the subgroup at HUH, 86% of possible patients were recruited, but in the subgroup consisting of patients at the other seven hospitals, the recruitment rate was lower, 23%. We claim both two subgroups could be regarded as unselected samples of hospital admitted GBS since the two subgroups were comparable with regard to mean age, age and sex distribution, previous medical history, antecedent events, use of immunomodulatory treatments and disease severity. These findings, taken together, support our contention that the investigated study group is an unselected sample that can be considered representative of the population of GBS patients in Sweden. Compliance throughout the study was very good; only two patients withdrew, in spite of the extensive data collection. The familiar context of the home environment provided a relaxing atmosphere and allowed for a more comprehensive assessment of patient impairment than would have been possible in a hospital setting. Implementation of the selected measures was feasible in the home environment, and these measures were found to be sensitive indicators of long-term recovery in GBS. The MMSE was used to confirm that patients could understand oral and written instructions, and all scores fell within the normal range.

Many previous studies have used the scale by Hughes [6] to evaluate outcome of GBS. Our result were 21% of the patients being grade 2 or worse at 2 years are in accordance with other studies [3,21–23]. The Hughes scale focuses mainly on walking but a wider variety of measures could give a more precise description of the patient's clinical status. With regard to muscle strength, we recorded submaximal total muscle scores in 55% of our patients 2 years after onset. Although, no other prospective, population-based study investigating muscle strength in GBS could be found in the literature, in two cross-sectional studies, reduced muscle strength was reported in 30% of patients 2–24 years after the onset of severe GBS [4] and in 21% 1–14 years after onset [24]. With regard to gait, we found that 7% of our patients were unable to walk 10 m, and that 26% displayed subnormal walking speed, 2 years after onset; these figures are in accordance with those of previous prospective studies of unselected GBS patients, in which 10–20% of patients were unable to walk unaided 1–2 years after onset [20–23]. With regard to the ability to run 10 m, our findings that 24% of patients were unable to run at 1 year, and 21% at 2 years, reflect slightly greater impairment than those reported in the prospective study by Rees et al. [22], in which 18% of patients were unable to run 1 year after GBS onset.

In the present study, facial-muscle weakness was found still 2 years after onset in 12% of our, which is slightly higher than the figure of 9% for patients with severe GBS,

2–24 years after onset [4]. For the individual patient, facial-muscle paresis can have a subjective impact on social life despite a good physical recovery; detailed information about long-term facial-muscle function has rarely been reported.

At 2 weeks, 71% of our patients reported pain, which is in accordance with the figure of 50–85% from other prospective studies of unselected GBS patients [23,25]. During the 2-year follow-up of the present study, pain slowly dissipated; it occurred most prominently in the form of muscle ache, a phenomenon also reported by Bernsen et al. [26]. Fatigue has rarely been investigated in GBS. We found that 40% of patients still reported fatigue 2 years after onset. Interestingly, 59% of the patients reporting fatigue displayed, at most, only minor motor impairments; thus, fatigue in GBS might be due to the change in lifestyle that the deterioration of physical condition represents. In a cross-sectional study, Merkies et al. [27] found that 80% of patients with residual signs of GBS 3–6 years after onset experienced fatigue, and, in accordance with our own findings, that a majority of patients who had regained normal strength reported severe fatigue. Further studies are needed to more fully investigate the impact of fatigue in GBS. At 2 years, 52% of our patients displayed impaired sensation or reported the presence of paraesthesia; by comparison, in cross-sectional studies of patients with severe GBS [4,26], 49–69% of patients were reported to suffer from long-term sensory deficits. Detailed information on active and passive motor performance, balance, grip strength and finger dexterity have not been reported in any previous study of GBS.

Autonomic dysfunction was present in the patients in our study primarily during the first 6 months after onset. Excessive sweating was the main form of dysfunction, a phenomenon also reported by Tuck et al. [28]. At GBS onset, 40% of our patients experienced disturbances of urinary function, compared to 25–32% in other studies [23,29], a discrepancy perhaps explained by the use of self-reporting in the present study. In our study, long-term disturbance of bowel function was mainly attributable to constipation stemming from decreased mobility.

5. Conclusions

In summary, in the present study, GBS-related impairment was found to be extensive 2 weeks after onset. Recovery occurred primarily during the first year after onset. Motor impairment and sensory impairment were each still detectable in a majority of patients at 2 years. Impairment was somatically widespread at 2 years; it may persist beyond that time point. Despite the effectiveness of treatments, these negative outcomes of GBS still persist. Our results are comparable to those from other studies regarding gait, pain and sensation; however, we report higher frequencies of reduced muscle strength, affected facial-muscle function and running disability. Further, evaluations of GBS-related impairment will need to include an investigation of the impact on other domains of the ICF, such as “activity” and “participation”.

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II

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Disability and health-related quality of life in Guillain–Barré syndrome during the first two years after onset: a prospective study

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Objective: To describe changes in disability and health-related quality of life in patients with Guillain–Barré syndrome in Sweden during the first two years after onset.

Subjects: Forty-four patients were recruited from eight different hospitals, and 42 of them (mean age 52 years) were followed for two years. Evaluations were performed, primarily as home visits, at two weeks, two months, six months, one year and two years after onset.

Main measures: Disability was measured using the Katz Personal and Extended Activities of Daily Living Indexes, the Barthel Index, the Frenchay Activity Index and assessments of work capacity; health-related quality of life using the Sickness Impact Profile.

Results: At two weeks, one year and two years after onset of Guillain–Barré syndrome, 76%, 14% and 12% of patients were dependent in personal activities of daily life (ADL); and 98%, 28% and 26% were dependent in instrumental ADL. At two weeks, all of the patients that were working before onset were unable to work owing to Guillain–Barré syndrome; at two years, 17% were unable to work. At two weeks, scores on Sickness Impact Profile were elevated in all dimensions; at two years, they remained elevated in the physical dimension and in the categories home management, work and recreation and pastimes.

Conclusions: The impact of Guillain–Barré syndrome on ADL, work, social activities and health-related quality is considerable two years after onset and presumably persists beyond this time point.

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Introduction

Guillain–Barré syndrome is an inflammatory, demyelinating polyradiculoneuropathy of acute or subacute onset. Early clinical features include progressive muscle weakness and sensory changes.[1] The acute onset is often followed by a plateau phase of 2–4 weeks, before the start of recovery, which usually lasts 1–2 years.[2] In a prospective, longitudinal study of impairment and walking limitation in patients with Guillain–Barré syndrome in Sweden, we have previously described that recovery mainly occurs during the first year after onset.[3] At two years after onset, residual motor and sensory impairments were still seen in 23/42 patients (55%), and pain and fatigue were reported by about a third of all patients. Impairments may persist beyond this time point, since recovery during the second year was mainly in the area of muscle strength.[3]

In studies on patients with Guillain–Barré syndrome, disability has mainly been defined as limited walking ability and has often been assessed using a single measure, the scale originally developed by Hughes.[4] Limited walking ability and disability has been reported in 10–20% of patients in follow-up studies: at one year after onset in 5/51 patients (10%),[5] 10/73 patients (14%),[6] 22/197 patients (11%)[7] and 57/365 patients (16%),[8] and at two years after onset in 22/108 patients (20%).[9] As this disease encompasses a variety of clinical symptoms, each with a potentially widespread impact on many areas of life, not only walking ability should be included when evaluating disability. In the International Classification of Functioning, Disability and Health,[10] disability is an umbrella term for the aspects impairment, activity limitation and participation restriction. In recent years, it has been increasingly recognized that the impact of Guillain–Barré syndrome on activity and participation,[10] also needs to be investigated.[11] In addition, a measure assessing the patient's own perception of their health life should be incorporated into any evaluation of the impact of disease, since residual deficits can greatly affect health status. In studies of Guillain–Barré syndrome, adverse impact on health status, work capacity and private life has been demonstrated as long as 3–6 years after the onset of severe forms of Guillain–Barré syndrome.[12,13] These results, from cross-sectional studies of selected samples of patients, need to be confirmed in studies with a prospective design in unselected samples. The aim of the present, prospective study was to describe, in an unselected sample of Swedish patients with Guillain–Barré syndrome, changes in disability and health-related quality of life during the first two years after onset.

Methods

Subjects

This study was conducted prospectively from April 1998 to December 1999. Patients were recruited from the following eight hospitals located in central Sweden, whose collective catchment area is about 3.6 million inhabitants: Karolinska University Hospitals at Huddinge and at Solna, Uppsala Akademiska Hospital, Örebro University Hospital, Västerås Hospital, Falun Hospital, Borås Hospital and Sahlgrenska University Hospital. Approval for the study was obtained through the Regional Ethics Committee of Karolinska Institutet in Stockholm. All patients above 18 years of age diagnosed with Guillain–Barré syndrome according to the criteria of Asbury and Cornblath[14] were given written information about the study and asked about participation. Informed consent was obtained from each patient entering the study. Of the 49 patients initially recruited, five were not enrolled to the study: for two patients the original diagnosis was revised to chronic inflammatory demyelinating polyradiculoneuropathy; and three patients were adjudged to have other diseases. In addition, two enrolled patients declined further contact during follow-up. Thus, a total of 42 patients were enrolled and followed for two years (Table 1). At one year, one of the authors (RP), a clinical neurologist, confirmed the patients' diagnoses based on medical records. Selection bias was considered to be modest, and our case series was deemed to be representative of Guillain–Barré syndrome patients seen at hospitals in Sweden.[3]

Demographic characteristics, previous medical history, antecedent events occurring within four weeks of onset of Guillain–Barré syndrome, and the use of immunomodulatory treatments and mechanical ventilation were collected from medical records and interviews with the patients (Table 1).

Table 1 Characteristics of patients with Guillain–Barré syndrome ($n = 42$) at disease onset, events occurring during the four weeks preceding onset, medical history, and the use of immunomodulatory treatments and mechanical ventilation during the course of disease

Variable	Numbers or other indicated value (%)
Age, mean ± standard deviation (range), years	52 ± 18 (20–80)
Men/women	24/18
Living with spouse	28
Apartment/detached house	26/16
Swedish/other nationality	35/7
Basic/higher education	12/30
Mini-Mental State Examination, median (interquartile range) (maximum = 30)	29 (28–30)
Previous medical history, total	16 (38)
Cardiovascular disorder	10
Diabetes mellitus	5
Musculoskeletal disorder	5
Respiratory disorder	2
Neurological disorder	2
Antecedent event, total	30 (71)
Respiratory infections	14
Gastric infections	8
Other infections	5
Surgery/vaccination/pregnancy	1/1/1
Immunomodulatory treatment	36 (86)
Intravenous immunoglobulin (IvIg)	25
Plasma exchange (PE)	5
IvIg and PE	4
IvIg/PE and steroids	2
Mechanical ventilation	9 (21)

The mean age of the patients at onset was 52 years; 12 patients were over 65. Of the 16 patients that had a medical history, five patients with cardiovascular disorders were under treatment for hypertension. The choice of immunomodulatory treatment was decided upon at the participating hospitals. Treatment was given to 36 patients, starting a median of six days (interquartile range (IQR) 3–12) from the clinical onset. Mechanical ventilation was required in nine patients, for a median of 20 days (IQR 7–59).

Procedure

Baseline evaluations were performed two weeks (± one week) after the clinical onset of symptoms, and follow-up evaluations two months (± two weeks), six months (± one month), one year (± two months) and two years (± two months) after onset. Two of the authors performed the evaluations, independently of one another (AF 73% of evaluations, UE 27%). Concordance in ratings was assessed, both prior to start of the study and throughout its course, and adjudged to be satisfactory. Baseline evaluations were mostly performed at the local hospital, and follow-up evaluations, to ensure compliance, in the patients' homes.

Measurements

Mental function was screened using the Mini-Mental State Examination[15] at the two-week evaluation, or when the patient's medical status permitted it. Scores on the Mini-Mental State Examination were in the normal range (Table 1). Dependency with activities of daily living (ADL) was assessed, both retrospectively (before onset of Guillain–Barré syndrome) and at all follow-up evaluations, by means of interviews with the patient, using the Katz Personal ADL (P-ADL) Index,[16] the Katz Extended ADL (E-ADL) Index[17] and the Barthel Index.[18] Four items of instrumental ADL in the Katz E-ADL Index were used: shopping, cooking, cleaning indoors and transportation outdoors.[17] The Barthel Index was included because it contains items related to mobility, such as negotiating stairs and propelling one's wheelchair. The Frenchay Activity Index[19] was used to measure the frequency of social and lifestyle activities, retrospectively and at follow-up evaluations from two months and onwards. The Frenchay Activity Index was originally developed and validated for use in stroke patients,[19] but it has been used in patients with other disorders as well.[20] Changes in work capacity and in housing attributable to Guillain–Barré syndrome were recorded at all evaluations.

Measurement of health-related quality of life was performed at all evaluations using a Swedish version[21] of the Sickness Impact Profile.[22] The Sickness Impact Profile measures the overall impact of disease and consists of 12 categories with a total of 136 items that each describe an activity or aspect of behaviour or specify a dysfunction. Three categories form an aggregated physical dimension, and four categories an aggregated psychosocial dimension. The remaining five categories – sleep and rest, eating, work, home management and recreation and pastimes – are independent. Scores were calculated for

each category, and for the aggregated physical and psychosocial dimensions, with higher scores indicating higher perceived dysfunction. Scores were compared with those from the general Swedish adult population.[23]

Coping capacity, as represented by the concept of sense of coherence, was measured with the 13-item version of the Sense of Coherence Scale[24] at follow-up evaluations from two months and onwards. The relation between scores on the Sense of Coherence Scale and scores on the Sickness Impact Profile was investigated. Comparisons were also made using reference values from the general Swedish adult population.[23,25]

Statistical analysis

Because the analysed data were ordinal or had skewed distributions, nonparametrical statistical methods were primarily used. Medians and interquartile ranges (IQR) have been cited in presentations, together with means and standard deviations (SD). Changes between evaluations were tested with the Wilcoxon signed-ranks test. Differences between scores on the Sickness Impact Profile and reference values were tested with the sign test. Spearman rank-order correlation coefficients have been cited to express relations between scores on the Sense of Coherence Scale and scores on the Sickness Impact Profile. Probability values less than 0.05 were considered statistically significant.

Results

Results of ADL and the Frenchay Activity Index are presented in Table 2. Before onset, one patient was dependent with the item continence on the Katz P-ADL Index, and one patient with the item cleaning indoors on the Katz E-ADL Index. On the Katz P-ADL Index and the Barthel Index, scores increased significantly between evaluations during the first six months after onset, but not thereafter; five patients (12%) had submaximal scores on both the Katz P-ADL Index and the Barthel Index at two years after onset of Guillain–Barré syndrome, and bathing was the most affected item on both indexes. Scores on the Barthel Index at two years were significantly decreased compared with scores before onset of Guillain–Barré syndrome. On the Katz E-ADL Index, score increased significantly between evaluations during the first year after onset, but not thereafter; 11 patients (26%) had submaximal scores on the Katz E-ADL Index at two years, and the most affected item was cleaning indoors.

Scores on the Frenchay Activity Index decreased significantly from before onset of Guillain–Barré syndrome to evaluation at two months. Between evaluations at two months and two years, scores increased significantly. There was no significant change between scores on Frenchay Activity Index before the onset of Guillain–Barré syndrome and scores at two years, but the range of scores was wider at two years (1–45) than before onset (21–45). Only one item, the frequency of walking

Table 2 Measurement of activities of daily living before onset of Guillain–Barré syndrome (GBS) and at all evaluations ($n = 42$)

Variable (range of possible scores)	Number of patients or other indicated value					
	Before GBS	2 weeks	2 months	6 months	1 year	2 years
Dependent on Katz Personal ADL Index	1	32	11	7	6	5
Dependent on Katz Extended ADL Index	1	41	30	12	12	11
Barthel Index (0–100)						
Median (interquartile range)	100 (100–100)	40 (18–81)	100 (83–100)	100 (100–100)	100 (100–100)	100 (100–100)
Mean	100	47	84	91	94	97
Frenchay Activity Index (0–45)						
Median (interquartile range)	32 (29–35)		16 (5–24)	30 (19–34)	31 (24–36)	32 (25–37)
Mean	32		15	26	28	29

ADL, activities of daily living.

outside for more than 15 min, had significantly decreased score at two years compared with score before onset.

Before the onset of Guillain¬Barré syndrome, 24 patients were working or studying, 11 were retired due to age, three were unemployed and four were retired due to another illness or on sick leave. At the baseline evaluation, all patients capable of working were on sick leave. At two years, 19 patients (45%) patients had returned to work, but two of them worked only part-time due to residual deficits of Guillain¬Barré syndrome; seven patients (17%) were on sick leave or had retired due to residual deficits; two patients (5%) were on sick leave due to another illness; and an additional three patients had retired due to age, a total of 14 patients (33%) retired due to age. At evaluation at two weeks, 28 patients lived with a spouse, a figure that did not change during the study period. Only one patient was forced to change housing during the study period, as this patient was unable to climb stairs owing to residual weakness in the legs. An additional eight patients needed modifications to their homes such as removing doorsteps and adding support handles in their bathrooms, but did not have to move as they lived in single-storey houses or had access to an elevator.

The results on the Sickness Impact Profile are shown in Table 3 and Figure 1. Three patients on mechanical ventilation were unable to complete the questionnaire at the two-week evaluation. One patient declined to complete both the Sickness Impact Profile and the Sense of Coherence Scale at the follow-up evaluations. Comparatively worse scores were seen at all evaluations in the categories home management, work and recreation and pastime (Figure 1). Scores on the overall Sickness Impact Profile and the aggregated score in the physical dimension, as well as scores in the categories sleep and rest, home management and recreation and pastime, decreased significantly between evaluations during the first year after onset, but not thereafter. The aggregated score in the psychosocial dimension decreased significantly between evaluations during the first six months. The score in the category eating decreased significantly the first two months. In the category work, scores changed significantly between the evaluations at two months and one year. Scores on the Sickness Impact Profile at two years were significantly lower only for the aggregated score in the physical dimension compared with reference data from the general Swedish adult population.[23] The 10 most frequently affirmed items in the Sickness Impact Profile at two years are listed in Table 4. The item 'I walk more slowly' was affirmed by the greatest number of patients ($n =$ 18 (43%)).

Scores on the Sense of Coherence Scale did not change significantly over the study period; mean scores at all the evaluations ranged from 76 to 79, and standard deviations from 9 to 10. At all evaluations, mean scores were higher than reference scores from the general adult population (in which mean scores ranged from 61 to 65;[23,25] standard deviations in our study group and the reference population were similar, however. There were significant correlations between higher scores on the Sense of Coherence Scale and lower scores on the overall Sickness Impact Profile both at one year ($r = -0.336$) and two years ($r = -0.311$), but not at any other evaluation time point.

Discussion

The present study provides an unusual view of Guillain¬Barré syndrome, as it examines ¬ prospectively and longitudinally ¬ disability and health-related quality of life, and uses the home as the primary site for evaluations. The study's results confirm that the great majority of patients with Guillain¬Barré syndrome were dependent in ADL two weeks after onset, but that this dependency resolves in most of them during the first six months. Regarding the long-term impact of Guillain¬Barré syndrome on ADL, our results suggest that, two years after onset of Guillain¬Barré syndrome, marked dependency persist in about a quarter of patients, a dependency that is not attributable to any concomitant disease. Although ceiling effects were found on the Barthel Index ¬ a phenomenon also reported in other studies[11,26] ¬ our results appear to be both valid and reliable. Previous studies have reported slightly lower figures, as at one year 6/62 patients (10%) were dependent with ADL using the Barthel Index,[27] and at two years 48/297 patients (16%)

Table 3 Health-related quality of life as measured by the Sickness Impact Profile at all evaluations

Category	2 weeks ($n = 39$) Mean Median (IQR)	2 months ($n = 41$) Mean Median (IQR)	6 months ($n = 41$) Mean Median (IQR)	1 year ($n = 41$) Mean Median (IQR)	2 years ($n = 41$) Mean Median (IQR)
Overall	37.7 38.9 (29.0–47.9)	21.2 18.3 (7.9–30.2)	12.2 7.4 (2.0–17.1)	9.5 4 (0.4–12.4)	8.6 3.9 (0–11.3)
Physical dimension	46.6 50.3 (37.7–58.6)	22.4 19.9 (6.2–36.1)	12.7 8 (0–19.7)	10.5 1 (0–14.9)	10.6 2.8 (0–13.8)
Ambulation	37.8 38.9 (29.0–42.2)	27.7 29 (10.6–40.4)	16.1 16.3 (0–29.9)	11.9 4.2 (0–23.5)	12.6 0 (0–24.3)
Mobility	46.9 50.8 (27.9–67.5)	23.8 15.2 (0–40.3)	11.8 0 (0–10.8)	7.3 0 (0–0)	8.6 0 (0–10.0)
Body care and movement	50.2 53.8 (35.4–66.2)	20.1 14.5 (1.1–31.1)	10.7 3.2 (0–13.1)	11.1 1.5 (0–13.1)	10.4 0 (0–14.6)
Psychosocial dimension	22.2 18.3 (11.2–31.7)	12.2 5.6 (1.4–19.0)	7.8 2.2 (0–13.5)	6.7 1.9 (0–10.4)	5.2 1.9 (0–6.7)
Social interaction	28.3 25.5 (15.4–37.5)	17.3 8.5 (0–27.9)	8.4 3 (0–11.9)	6.4 0 (0–8.1)	5.1 0 (0–4.6)
Alertness behaviour	16.5 10.3 (0–28.3)	8.6 0 (0–9.6)	10 0 (0–14.9)	8.7 0 (0–9.6)	7 0 (0–9.8)
Emotional behaviour	22.6 17.8 (0–39.0)	9 0 (0–11.4)	7.4 0 (0–10.5)	7.5 0 (0–9.6)	5.1 0 (0–9.8)
Communication	15.8 10.6 (9.7–21.1)	8.8 0 (0–15.7)	4.8 0 (0–9.7)	4.5 0 (0–9.7)	2.8 0 (0–4.4)
Independent categories					
Sleep and rest	46.4 52.5 (28.7–61.1)	25.8 26.1 (7.4–34.5)	15.2 11.6 (0–23.8)	8.3 0 (0–12.2)	10.1 0 (0–12.2)
Eating	17.7 14.9 (5.2–26.1)	6.9 0 (0–5.2)	4.9 0 (0–0)	2.4 0 (0–0)	0.8 0 (0–0)
Work[a]	70.1 70.1[b] (70.1–70.1)	62.6 70.1[c] (70.1–70.1)	40.2 47.2[c] (8.4–70.1)	29.2 8.4[c] (0–70.1)	25.1 8.4[b] (0–70.1)
Home management	74.2 79.3 (69.0–85.3)	49.3 53.8 (21.1–79.3)	21.6 0 (0–39.8)	14.8 0 (0–16.3)	15.3 0 (0–15.8)
Recreation and pastime	51.4 57.6 (39.1–66.1)	36.8 41.2 (12.1–55.4)	24.5 18.7 (0–37.7)	16 9.2 (0–22.2)	14.3 0 (0–24.9)

IQR, interquartile range.
[a]Patients retired due to age are not included.
[b]$n = 28$.
[c]$n = 31$.

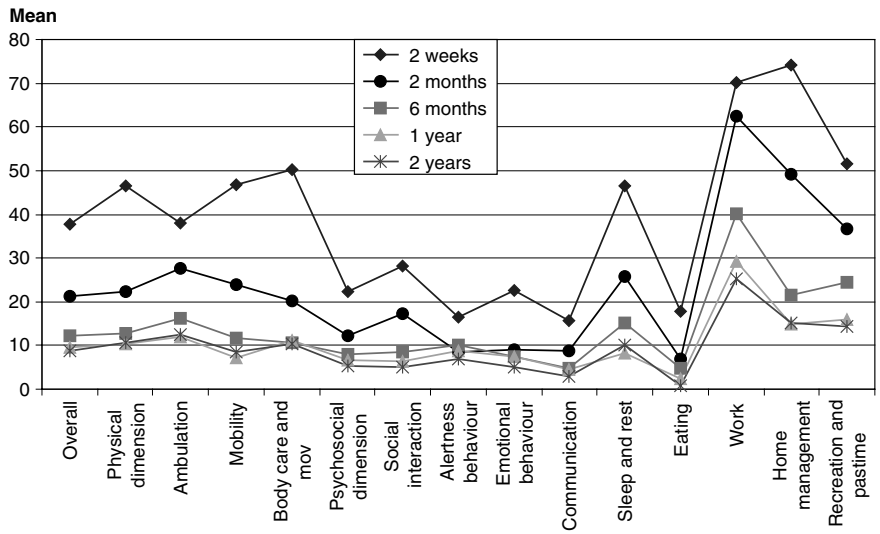

Figure 1 Mean score on the Sickness Impact Profile at all evaluations. The category 'work' does not include patients retired due to age.

had residual disability interfering with daily activities.[28]

Recently, the impact of Guillain–Barré syndrome on psychosocial domains has received some attention.[11,13] Studies have reported reductions in leisure activities, 3–6 years after the onset of severe Guillain–Barré syndrome in a high proportion of patients, 52/116 (44%),[13] as well as limitations in social activities in 5/10 patients with persistent disability related to Guillain–Barré syndrome.[26] We found decreased frequencies of social and lifestyle activities two years after onset in 24% of our patients – a figure that in all likelihood is consistent with the higher percentages observed in selected samples of patients with Guillain–Barré syndrome.[13,26] Our results reveal the existence of considerable long-term limitations, attributable to Guillain–Barré syndrome, in activity and participation in everyday situations.

With regard to work capacity and employment, the Dutch study reported that 31/82 patients (38%) with severe Guillain–Barré syndrome were unable to work or had been forced to change jobs 3–6 years after onset.[13] In the British study on patients

Table 4 The 10 most frequently affirmed items in the Sickness Impact Profile two years after onset of Guillain–Barré syndrome ($n = 41$)

Categories	Item affirmed	Number of patients
Ambulation	'I walk more slowly'	18
	'I walk shorter distances or stop to rest often'	11
Body care and movement	'I kneel, stoop or bend down only by . . .'	16
	'I am very clumsy in body movements'	13
	'I am in a restricted position all the time'	12
Home management	'I am not doing heavy work around the house'	13
Sleep and rest	'I sleep less at night . . .'	12
Recreation and pastimes	'I am cutting down on some of my usual . . .'	11
	'I am doing more inactive pastimes in place . . .'	10
	'I am going out for entertainment less often'	10

Clinical messages

- At two weeks after onset of Guillain¬Barré syndrome, 98% of patients were dependent in activities of daily living; dependency persisted in 26% at two years.
- At two years, 24% of patients still had decreased frequency of social and lifestyle activities, compared with levels before onset of Guillain¬Barré syndrome.
- The impact on health-related quality of life was extensive at two weeks after onset; it was still observable two years later, in the physical dimension of the Sickness Impact Profile and in categories regarding home, work and recreation.

with persistent disability, only 1/6 patients had returned to their previous place of work.[26] The impact on working life revealed by our study ¬ in which nine patients (21%) were either unable to work or were working only part-time ¬ is similar to a recent Danish study in which 6/23 patients (26%) experienced a negative impact on working ability.[29] Results from studies on employment and work capacity may differ on account of both methodological differences and differences in the social security systems of the countries in which the studies were performed. Nonetheless, our results confirm that Guillain¬Barré syndrome could pose a threat to the stability of working life in a substantial proportion of patients.

The Sickness Impact Profile has been used in one earlier study of Guillain¬Barré syndrome,[12] the Dutch study of patients with severe disease cited above where scores 3¬6 years after onset was significantly increased, compared with results in a healthy control group. Decreased scores in the physical domains of the SF-36 health survey questionnaire have been found both in a study of patients with residual symptoms after immune-mediated polyneuropathies (mainly Guillain¬Barré syndrome)[30] and in the Danish study cited above.[29] Our results, which show that the most affected categories were home management, ambulation and work, were in agreement with results of the Dutch study;[12] yet we also report high dysfunction in the category recreation and pastime. The adverse impact on recreational activities is consistent with the results found on the Frenchay Activity Index.

We measured sense of coherence for analytical purposes, since health-related quality of life may be dependent on coping capacity. The correlations in our study observed between scores on the Sense of Coherence Scale and scores on the Sickness Impact Profile are in agreement with studies of the general population.[23] Although mean and median scores on the Sense of Coherence Scale were high in our study, health-related quality of life was affected at all evaluations. Two years after onset, the effects of Guillain¬Barré syndrome are likely to persist and likely to exert a negative impact on health-related quality of life in a considerable proportion of patients, as 50% of patients had a higher score on overall Sickness Impact Profile at this time than the score reported in the general population.[23]

In summary, at two weeks after onset, the impact of Guillain¬Barré syndrome on ADL, social activities and health-related quality of life was extensive, and it persisted two years after onset, despite significant improvements over time. Our results are in part consistent with those of other studies ¬ particularly with regard to the impact of Guillain¬Barré syndrome on work capacity and health-related quality of life ¬ but indicate a higher impact than earlier reported on ADL and social activities. Our findings confirm the widespread impact of Guillain¬Barré syndrome in several life areas and suggest that health professionals need to have a broad, long-term perspective when treating patients with this disorder.

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III

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USE OF HEALTHCARE, PATIENT SATISFACTION AND BURDEN OF CARE IN GUILLAIN-BARRÉ SYNDROME

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Objective: **The aim of this study was to investigate, in an unselected sample of patients with Guillain-Barré syndrome in Sweden, the utilization of healthcare resources, satisfaction with these resources, informal help and the burden of care on family caregivers during the first 2 years after onset.**
Subjects: **Forty-four patients were enrolled from 8 hospitals, and 42 of them were followed for 2 years.**
Methods: **Data on the utilization of hospital inpatient and outpatient care, primary care and community-based services were collected via computerized registry information, medical records and a specific protocol. Patient satisfaction and the burden on family caregivers were studied using questionnaires.**
Results: **Forty-one patients required inpatient hospitalization for a mean of 82 days. Patients with persistent dependency during activities of daily living had significantly longer hospital stays and more days of outpatient rehabilitation. The majority of patients were satisfied with their care, but dissatisfaction was found regarding information and finances. At 2 years after onset, 26% of patients still depended on informal help. The spouses expressed increased concern and responsibility for household and family.**
Conclusion: **Patients with persistent disability due to Guillain-Barré syndrome were found to have long-term need for services from the healthcare system and informal help.**

Key words: health services, patient satisfaction, caregivers, Guillain-Barré syndrome.

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INTRODUCTION

Guillain-Barré syndrome (GBS) is an inflammatory, demyelinating polyradiculoneuropathy. The early clinical features include progressive muscle weakness and sensory changes (1). The acute onset phase is followed by a plateau phase of 2–4 weeks, before the start of recovery. GBS is characterized by defects in several physiological systems with a variety of clinical symptoms, each with a potential impact on many aspects of function and activity. The treatment strategies for GBS involve immunomodulatory treatment to shorten the acute phase (2) although the effect on long-term outcome and disability is unclear. Plasma-exchange and intravenous immunoglobulin (IVIg) have been found to have equivalent efficacy in hastening recovery for patients with GBS who require assistance to walk (3). The outcome of GBS was traditionally considered as favourable; however, incomplete recovery with residual signs has been reported in proportion about 50% of patients at 1–2 years after onset (4–7). This partial recovery may be a significant cause of long-term disability. In a prospective study over 2 years, we found that 26% of patients were dependent in aspects of activities of daily living (ADL) and 24% reported a lower frequency of social activities (8). Other follow-up studies have reported disability in 10–30% of patients with GBS at one year after onset of disease (6, 7, 9) and in 16–20% at 2 years (10, 11).

During the course of GBS, hospital care is often required as acute care in the initial phase of the disease and as rehabilitation in the recovery phase. On retrospective data, poor walking ability after one month (6), increased age (12, 13), need of ventilator support (12, 14, 15), autonomic dysfunction (14) and cranial nerve dysfunction (14) were found to increase the duration of inpatient hospital stay. An individual-based approach in prospective studies accounting for disability enhances the possibility of catching the utilization of all health-related services. No study has been found investigating the utilization of healthcare resources, including rehabilitation and outpatient therapy.

Patient satisfaction, a multidimensional concept, includes the elements of subjectivity, expectation and perception (16). Patient satisfaction has been used to measure various outcome aspects of care, and is also of importance in the planning of rehabilitation services. This has not been studied before in patients with GBS.

Patients with long-term disability may require assistance with ADL and social activities from caregivers. In studies on multiple sclerosis, 30% of patients reported that help from a caregiver was needed (17), and in stroke 70% (18). In Sweden, formal caregivers are identified as a community-provided service, and informal caregivers are spouses, other family members or friends. In a study on stroke, informal caregivers were found to experience considerable strain (19). The level, amount of time as well as the psychosocial and physical burden on caregivers has not been studied for GBS. The aim of the present study was

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to explore, in an unselected sample of patients with GBS in Sweden, the utilization of healthcare resources, the satisfaction with these healthcare resources, the amount of informal help and the burden of care on spouses during the first 2 years after onset of GBS.

METHODS

Subjects

Eight hospitals in central Sweden took part in this prospective study from April 1998 to December 1999. Patients, above 18 years of age and diagnosed with GBS according to the criteria of Asbury & Cornblath (20), were given written information about the study and asked about participation. Informed consent was obtained from each patient entering the study. Forty-nine patients were initially enrolled in the study. In 2 of these cases, the original diagnosis was revised to chronic inflammatory demyelinating polyradiculoneuropathy, 3 patients suffered from other diseases that prevented follow-up and 2 patients declined further contact during follow-up. Thus, a total of 42 patients (mean age 52 years, 12 patients were over 65 years of age) were followed for 2 years. At the evaluation at one year, a clinical neurologist confirmed the patients' diagnoses, on the basis of medical records. The majority of patients were enrolled at the Karolinska University Hospital at Huddinge (22 patients) and at Solna (5 patients). Fifteen patients were enrolled at 6 other hospitals: Sahlgrenska University Hospital (6 patients), Örebro University Hospital (4 patients), Uppsala University Hospital (2 patients), Borås Hospital (1 patient), Falun Hospital (1 patient), and Västerås Hospital (1 patient).

Measures

The patients were assessed and interviewed – depending on their individual situation – at home or at their local hospital/rehabilitation centre; at 2 weeks, 2 months, 6 months, 1 year and 2 years after GBS onset (4, 8). Evaluations were conducted by 2 trained physical therapists, independently of one another. Demographic characteristics, pre-existing illness, antecedent medical events, the use of immunomodulatory treatments and any use of mechanical ventilation were collected from medical records. Dependency in ADL was investigated via the Katz extended ADL (E-ADL) index (21, 22), retrospectively before GBS onset, and thereafter at all the evaluation time-points. Dependency was categorized as less than full score on the Katz E-ADL Index.

Data on the utilization of hospital inpatient and outpatient care and primary care was obtained for patients recruited at the Karolinska University Hospitals, Huddinge and Solna, via a computerized registry at the Stockholm County Council. For patients recruited at the other 6 hospitals, data was obtained through the perusal of medical records. Data was collected from the 6-month period before the onset of GBS until 2 years after onset.

A specific protocol was used to collect data on community-based services and other health-related resources for the same time-period: technical aids in the areas of mobility, personal care and household management; permits for transportation service for disabled persons; home-help service (personal care, indoor cleaning and washing); community-based day care (for therapeutic and social reasons to the elderly); visits to chiropodist. Data was collected retrospectively for the period prior to the latest evaluation. Supplementary information was obtained from spouses or caregivers. A similar protocol was utilized to collect data in the home environment in Swedish studies of multiple sclerosis and stroke (17, 23).

A patient satisfaction questionnaire used in earlier studies of patients with rheumatoid arthritis (24), stroke (23) and multiple sclerosis (17), was used in a modified version featuring 14 items constructed as statements. The questionnaire is based on the taxonomy by Ware et al. (25). The statements were each linked to different dimensions of care; art of care, technical quality of care, accessibility, finances, availability, continuity and efficacy of care. Answers were given on a Likert scale with 5 response options that were dichotomized in the analysis to 3 options, satisfied/uncertain/dissatisfied. The questionnaire was filled in during the evaluations at 6 months, 1 year and 2 years after GBS onset. In the questionnaire, the patients also had the opportunity to write comments of their own.

At the evaluations at 6 months, 1 year and 2 years after GBS onset, the patients were asked to nominate their principal informal caregiver and to provide an estimate of the time the informal caregiver spent in helping them with physical tasks of ADL (hours/week).

A study-specific questionnaire on the burden of care was presented to the spouses at the evaluations at 1 year and 2 years. The questionnaire was developed specifically for the present study and the statements were partly adopted from the Sickness Impact Profile (26). It comprised 12 statements regarding responsibility, social and leisure activities and anxiety about the partner's health. The headline in the questionnaire was: "Your spouse has fallen ill with Guillain-Barré syndrome. How has this affected you?". Answers were on a Likert scale with 3 response options: "agree", "partly agree" or "disagree" with the statement. In the analysis the options "agree" and "partly agree" were summarized to "agree". The questionnaire was completed at the time of the evaluation or returned by post.

Statistical analysis

The data was analysed using descriptive statistics. Changes over time regarding the questionnaires were tested with the Wilcoxon signed rank test. Probability values less than 0.05 were considered statistically significant. In part of the analysis, subgroups were formed on the basis of any pre-existing illness or dependency with ADL. Differences between subgroups were tested with the Mann–Whitney test. Approval for the study was obtained through the Regional Ethics Committee of Karolinska Institutet in Stockholm.

RESULTS

The characteristics of the patients at disease onset are presented in Table I. Fatality rate was nil. The choice of immunomodulatory treatment was determined at the participating hospitals. Treatment was administered to 36 patients, starting a median of 6 days (inter-quartile range (IQR) 3–12) from clinical onset. Mechanical ventilation was required in 9 patients, for a median of 20 days (IQR 7–59). Before GBS onset, one patient was dependent with 1 item of personal ADL and another patient was dependent with 1 item of instrumental ADL on the Katz E-ADL Index (21, 22). At 2 years after onset, 11 patients were

Table I. *Characteristics of patients with Guillain-Barré syndrome at disease onset (n = 42)*

Variable	Number or value (%)
Age, median (range) (years)	54 (20–80)
Sex, men/women (*n*)	24/18
Living with spouse (*n* (%))	28 (67)
Swedish/other nationality (*n*)	35/7
Basic/higher education (*n*)	12/30
Working or studying/unemployed (*n*)	24/3
Retired due to age/due to illness (or on sick leave) (*n*)	11/4
Dependent with activities of daily living (*n* (%))	2 (5)
Pre-existing illness, total (*n* (%))	16 (38)
Cardiovascular disorder (*n*)	10
Diabetes (*n*)	5
Musculoskeletal disorder (*n*)	5
Respiratory disorder (*n*)	2
Antecedent medical events the 4 weeks before onset (*n* (%))	30 (71)
Immunomodulatory treatment (*n* (%))	36 (86)
Mechanical ventilation (*n* (%))	9 (21)

dependent with ADL; 5 were dependent with items of both personal and instrumental ADL, and 6 only with items of instrumental ADL. All but one of the dependent patients at 2 years had a pre-existing illness. The patients with a persistent dependency with ADL were significantly older ($p = 0.03$) than the independent patients, mean age 62 years vs 48 years. Marital status did not change during the study period. One patient had to move due to the residual deficits of GBS.

Utilization of healthcare resources

Data on the use of hospital inpatient and outpatient care and primary care for the patients with GBS are presented in Table II. The mean hospital inpatient stay was 82 days (standard deviation (SD) 99). Rehabilitation accounted for a major part of the healthcare use after GBS; days at rehabilitation department accounted for two-thirds of hospital inpatient days, while visits to a physical therapist accounted for 80% of total number of primary care visits.

Duration of inpatient hospital stay was less than 3 months for 31 patients (74%), 3–6 months for 7 patients (17%) and more than 6 months for 3 patients (7%). These 3 patients were still dependent with personal ADL at 2 years after onset. If days at outpatient rehabilitation centres are combined with visits to physical therapists and occupational therapists, 33 patients (79%) received outpatient rehabilitation/therapy during these 2 years, a mean of 68 days/visits (SD 52). Five further patients received only inpatient rehabilitation. Patients with persistent dependency with ADL had longer inpatient hospital stays ($p = 0.001$) and more days of outpatient rehabilitation ($p = 0.04$) than the independent patients. In all, a total of 29 patients visited a physician the 6-month-period prior to onset; a mean of 4 visits (SD 5), and during the following 2 years, all patients had visits with a mean of 13 (SD 13). Those patients with a pre-existing illness accounted for more of the visits to physicians, both before onset of GBS and during the following 2-year period, compared with those without a pre-existing illness ($p = 0.002$). The levels of healthcare, and the settings in which the patients received their care and rehabilitation, were partly determined by geography; in smaller cities, for example, primary care centres were the main providers of care and rehabilitation.

Other health-related services used during the study mainly consisted of technical aids and permits for health-related transportation (Table III). Before onset of GBS, 4 patients needed technical aids, 2 of them due to recent orthopaedic surgery. At 2 years after onset, 13 patients used technical aids to increase independence in ADL and mobility, 8 of them were above 65 years. The number of technical aids varied both between and within patients over time, and one patient had as many as 13 technical aids at 2 years. Ten patients used community-based service in their home for some period during the study period, which continued for 3 patients (7%) at 2 years after onset. The majority of patients who received treatment from a chiropodist during the study period had a pre-existing illness.

Patient satisfaction

Table IV presents data on the number of patients who manifested a need for care, and their satisfaction with the different dimensions of quality of care. One patient declined to answer the questionnaire. Reported patient satisfaction with the different dimensions of care varied at 6 months at between 66% and 98% of patients satisfied with care, and both at 1 year and 2 years between 61% and 100%. Least satisfaction was expressed with the dimensions "Good information" and "Finances" at all points in time. At between 6 months and 2 years, the number of satisfied patients decreased in 8 dimensions, although not significantly. Fifteen (36%) patients stated decreased satisfaction between 6 months and 2 years, while 9 (21%) stated increased satisfaction. Dissatisfaction or uncertainty in one or more dimensions persisted throughout the study period in 22 (52%) patients, 5 of them being in the dependent sub-group. Eleven patients wrote comments in the questionnaire regarding aspects on which they were dissatisfied. Seven patients commented that not enough physical therapy/rehabilitation was provided. Others commented that information of treatment and rehabilitation was poor. Several patients commented that follow-up visits to professionals only came as a result of their own initiatives, and would have preferred this to be scheduled by professionals.

Informal help

At 6 months after GBS onset, 16 patients (38%), all dependent with ADL, required help from an informal caregiver with ADL – personal care, cleaning, gardening, washing or household finances – for a mean of 19 hours/week (SD 41). Seven of them also used community home-help services. All but one of the informal caregivers was a member of the patient's family, and 9 were spouses. At one year, 11 patients (26%) received help for a mean of 25 hours/week (SD 33). Similarly, all but one of the informal caregivers was a member of the patient's family, and 6 were spouses. Four of these patients also used community home-help service. At 2 years, the same 11 patients received help from an informal caregiver, for a mean of 18 hours/week (SD 21). Three of them also used community home-help service.

Burden of care

Twenty-eight patients lived with a spouse, and 19 spouses (68%) answered the study-specific questionnaire (Table V). Answers on the questionnaire did not change significantly between the points in time. Approximately two-thirds of the spouses expressed concern over the patient's health and indicated increased responsibility for household and family. An increased burden of care was evident in the case of the spouses to patients with ADL-dependency as this impact was expressed on all but 2 statements.

Table II. *Utilization of inpatient and outpatient hospital services and primary care from the 6 months before onset of Guillain-Barré syndrome (GBS) to 2 years after onset (n =42)*

	0–6 months before GBS		0–6 months		7–24 months		Total 0–24 months		0–24 months		Total used days/visits
	n	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)	number of visits	%	
Emergency department (visits)	4	1 (0)	40	1 (1)	5	2 (1)	41	2 (1)	70		
Hospital inpatient care, total (days)	7	8 (6)	41	65 (45)	6	111 (157)	41	82 (99)	3355	100	
Intensive care unit	0		10	25 (17)	0		10	25 (17)	249	7	
Neurology department	0		38	17 (14)	1	4	38	17 (14)	659	20	
Rehabilitation department/centre	0		35	46 (35)	3	217 (169)	35	64 (90)	2255	67	
Other department	7	8 (6)	19	10 (16)	2	6 (4)	20	10 (16)	192	6	
Outpatient rehabilitation (days)	0		7	27 (9)	7	87 (65)	11	72 (57)	787		
Hospital outpatient care, total (visits)	12	5 (7)	32	4 (4)	37	7 (10)	40	10 (13)	387	100	
Physician, neurology	3	2 (1)	27	2 (1)	30	3 (2)	36	4 (3)	132	34	
Physician, rehabilitation	0		6	2 (1)	3	2 (0)	7	2 (2)	15	4	
Physician, other	10	5 (8)	20	4 (5)	20	8 (12)	29	8 (14)	217	56	
Speech therapist	0		1	11	2	6 (6)	2	12 (13)	23	6	
Primary care, total (visits)	24	5 (8)	31	20 (17)	33	34 (33)	36	48 (43)	1720	100	
Physician	22	2 (3)	24	2 (2)	28	4 (4)	32	5 (4)	171	10	
Nurse	8	1 (0)	11	3 (4)	15	4 (5)	19	5 (5)	91	5	
Physical therapist	4	12 (18)	23	20 (12)	23	40 (34)	29	47 (42)	1376	80	
Occupational therapist	1	4	8	6 (11)	4	8 (4)	9	9 (14)	82	5	

DISCUSSION

In this prospective study, we provide a view on GBS in the caring environment. For a majority of the patients, we found a considerable need for healthcare, some elements of dissatisfaction with care and a relevant role of informal care. Patients with GBS require a profound amount of hospital care, rehabilitation and other health-related services.

A limitation to the reliability of the study is that the data rely on different sources of information. The methodology for collecting data – a combination of patient interviews and computerized registries – used in the present study has also been found to be feasible in other Swedish studies (17, 23). We also found that the patients were accurate and precise in the information they provided when we verified their information against available medical records. On that basis, this twin-track method of collecting data was considered reliable. A second limitation is the selection of patients. The selection bias in the material has been discussed elsewhere and considered to be modest (4). The percentages of antecedent events, respiratory failures and fatality rates in the present study were similar to those of other recent prospective studies (6, 9, 11) and our case series was considered representative of patients with GBS seen at hospitals in Sweden.

The Swedish pattern of GBS care is characterized by the use of emergency and inpatient services – 95% of patients – as well as the predominant use of health resources for rehabilitation. Our figures were consistent with a larger population-based Swedish register-study by Jiang et al. (13), which reported a mean inpatient hospital stay of 86 days (SD 210). However, Jiang et al. included long-term care, which in the case of some elderly individuals amounted to more than 400 days. In our study, no patient needed long-term care in a nursing home. Comparing utilization of healthcare resources between countries is difficult, in view of different healthcare and economic reimbursement systems. Generally speaking, there is a lack of population-based data, in that the majority of earlier studies have focused on selected patient material. Zelig et al. (27) reported 24 patients with severe GBS, where 46% required hospitalization for more than 3 months, compared with our unselected material, where 26% had inpatient hospitalization for more than 3 months. Shorter hospital inpatient length of stays has been shown in retrospective studies – 39 days (SD 46) by Sheth et al. (12) and 61 days (SD 56) in a selected material by Meythaler et al. (14). In recent trials examining the efficacy of plasma exchange and IVIg, one study (3) reported similar figures on median time in hospitalization compared with our study (median 55 days, IQR 36–94), while the other study reported slightly lower figures (28).

Rehabilitation, either as inpatient or outpatient care, accounted for the major part of care. This information is not surprising, but stresses the importance of rehabilitation for this patient group. In an earlier study (4), we found about 50% of patients had residual impairment at 2 years. In the present

Table III. *Use of other health-related services from the 6 months before onset of Guillain-Barré syndrome (GBS) to 2 years after onset (n =42)*

	Before GBS		0–6 months		7–24 months	
	n	Median (range)	*n*	Median (range)	*n*	Median (range)
Technical aids (aids per person)	4	3 (1–4)	33	4 (1–14)	20	4 (1–17)
Permit for health-related transportation	1		27		16	
Home-help service	0		9		4	
Help from salaried personal assistants	0		0		1	
Community day care (visits)	0		1	16	2	17 (17–18)
Chiropodist (visits)	3	1 (1–2)	9	1 (1–3)	7	2 (1–6)

study, a subgroup of patients with long-term ADL-dependency needed prolonged hospital stays and rehabilitation periods. This rather high figure indicates a need for continuous physical therapy to maintain level of function and reduce disability, a need also expressed by several patients. Surprisingly, only 5% of primary care visits were for occupational therapy. Since 26% of the patients were ADL-dependent at 2 years, more task-specific training aimed at ADL-activities might be helpful. Our findings suggest that there is probably a larger need for rehabilitation than what is provided by the healthcare society in Sweden.

The majority of patients in this study were satisfied with their care. The level of patient satisfaction on this study was comparable with a Swedish study on stroke (23). Lower patient satisfaction was reported in a study on MS (17), perhaps because of the unpredictable and progressive course of that disease. Dissatisfaction mainly concerned information and finances, and there were similar findings in the stroke study on costs of care, and the MS study on information and accessibility to care. Satisfaction with care, however, may depend on the patient's expectations (16). In GBS, the patients may have expectations of a favourable outcome, even though it can be difficult to predict the long-term outcome for an individual patient. Twenty-eight patients were dissatisfied in one or more dimension at 2 years after onset, and of whom 64% had a residual disability due to GBS. Dissatisfaction with the amount of exercise therapy, seen here, constitutes a frequent finding in other studies on neurological diseases (17, 23, 29). Dissatisfaction with the disease-specific information, might correspond with a lack of provision of verbal and written information during hospital stay and follow-up visits.

The subgroup of patients with older age and/or pre-existing illness and persistent ADL-dependency had a larger utilization of all healthcare. A plausible explanation is that the combination of pre-morbid factors and the impact of GBS cause dependency and increased need for healthcare. The dependent subgroup had an increased utilization of health-related services, including chiropody. Residual sensory and motor impairment often affects overall function, this combined with diabetes and cardio-vascular disorder, may explain the use of chiropody and duration of hospital stay. In follow-up studies on stroke, 30–50% of patients visited a chiropodist (18, 30).

The proportion of patients, 26%, still receiving help from an informal caregiver 1–2 years after onset, was surprisingly high. Compared with the studies using the same methodology, in MS about 20% of sufferers had informal help from others (17) and in stroke 56%, but both studies presented less hours per week.

Table IV. *Satisfaction in patients with Guillain-Barré syndrome (n =41*)*

	6 months		1 year		2 years	
Dimensions and related matters	Manifested need	Satisfied/uncertain/ dissatisfied	Manifested need	Satisfied/uncertain/ dissatisfied	Manifested need	Satisfied/uncertain/ dissatisfied
Art of care						
Sympathy from staff		37/4/0		39/2/0		37/3/1
Kind treatment		38/3/0		39/2/0		39/2/0
Technical quality of care						
Good information		29/5/7		30/6/5		25/6/10
Training tailored to condition		35/4/2		36/1/4		35/1/5
Technical aids	23	22/1/0	18	18/0/0	16	16/0/0
Workplace adaptation	1	0/1/0	0		0	
Home adaptation	16	14/2/0	12	11/0/1	11	10/0/1
Health-related transport	27	25/0/2	17	15/1/1	16	13/1/2
Accessibility, easy to get in contact		34/4/3		35/4/2		32/5/4
Finances, cost of care		27/7/7		25/10/6		25/9/7
Availability						
Contact with expertise		35/4/2		36/3/2		32/6/3
Adequate amount of training		38/1/2		38/0/3		36/3/2
Continuity, meeting same staff		40/1/0		39/0/2		39/1/1
Efficacy, satisfied with received care		39/1/1		39/1/1		36/3/2

*One patient declined to answer.

Table V. *Burden of care on spouses of patients with Guillain-Barré syndrome 1 year and 2 years after onset, respectively (n =19)*

Statements in the study-specific questionnaire	1 year Agree/disagree (*n*)	2 years Agree/disagree (*n*)
I have to help my spouse with transfers and body care	5/14	4/15
I pay more attention to the needs of my spouse	13/6	14/5
I express concern over the health of my spouse	15/4	13/6
I take more responsibility for household chores now	12/7	9/10
I take more responsibility for the family	13/6	12/7
I have cut down on the time spent visiting friends and relatives	9/10	8/11
I spend less time on social and community activities now	9/10	7/12
My choice of leisure activities has changed	7/12	10/9
I spend less time on hobbies and recreational activities now	8/11	8/11
I get sudden frights	7/12	9/10
I have difficulty with activities involving concentration and thinking	7/12	5/14
I lie down more often during the day in order to rest	4/15	4/15

In the acute phase of GBS, the uncertainty about the course of the disease may cause distress and anxiety to family and relatives. During the recovery phase, there may be apprehension regarding the outcome and level of disability. Answers on the spouses' questionnaire reflect this persistence of concern and sense of responsibility. This burden might be relieved by routinely provided information, psychosocial support and increased services from the community.

In conclusion, this study describes use of health resources by patients with GBS in Sweden, as well as dissatisfaction with the costs of care and lack of disease-specific information. Informal caregivers play an important role in enabling GBS patients to still maintain independent living 2 years after onset.

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IV

Title

Falling ill with Guillain-Barré syndrome: patients' experiences during the initial phase

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ABSTRACT

Objective: Research describing patients' experiences of Guillain-Barré syndrome (GBS) is limited, but is important for identifying patients' need of support. The aim of this study was to describe experiences of falling ill with GBS, with focus on the onset of disease and the illness progression during hospital care.

Design: Qualitative interview study

Subjects: 35 persons, 20-78 years old.

Methods: The subjects were interviewed two years after the onset of GBS. The interviews were analyzed using qualitative content analysis.

Results: The onset was described as either an incomprehensible, prolonged, increasing deterioration with puzzling sensations or as a frightening, rapid onset with a sudden loss of body control. The majority of subjects relied heavily on reassuring information about the prognosis, and expressed immense confidence in being able to recover. During the early phase at the hospital, rapid and steady improvement inspired hope in many subjects. In contrast, some subjects at this early phase expressed doubts due to alarmingly slow recovery at this point in time. Feelings of fear and insecurity were evident when losing body functions, thus causing helplessness. Sensations of pain, numbness and lost body image increased their vulnerability. Ventilator-treated subjects expressed vivid memories of scary hallucinations.

Conclusion: The onset is characterized by an incomprehensible bodily deterioration or a frightening, rapid paralysis. In the initial phase, there is hope for recovery, which for many patients is reinforced by steady recovery. In contrast, early psychosocial support may be necessary for some patients with an alarmingly slow recovery.

INTRODUCTION

Guillain-Barré syndrome (GBS) is an inflammatory, demyelinating polyradiculoneuropathy of acute or sub-acute onset. GBS presents a variety of clinical symptoms, and may therefore have an impact on many aspects of the life situation, both in acute and later phases. Early clinical features include progressive muscle weakness, sensory changes, absent tendon reflexes, cranial nerve palsy, disturbance of autonomic function and pain (1). There are typically three phases to the course of GBS (1). The acute phase begins with the onset of symptoms for an average of 8-12 days before the illness peaks. This is followed by a plateau phase of 2 to 4 weeks, and then a recovery phase. Recovery may take 1-2 years, but occurs mainly during the first year after onset (2, 3). The treatment strategies for GBS involve immunomodulatory treatment to shorten the acute phase (4).

Research describing the patients' experiences of the course of disease is limited, however. An interview study including five subjects, found that the course of GBS required an adjustment to physical changes and having to handle emotional instability (5). Two interview studies focused on intensive care and found that anxiety, disorientation and stress were common in ventilator-treated patients (6, 7). Apart from these studies, a few case reports (8, 9) and autobiographies (10-13) report personal experiences of intensive care, the vulnerability of suddenly being helpless, a devastating illness but also a hopeful recovery. For the best possible care and support there is a need to describe how a heterogeneous group of GBS patients experience their situation since GBS can strike very differently, ranging from mild to severe symptoms. Therefore, the aim of this study was to describe experiences of falling ill with GBS, with the focus on the onset of the disease and the illness progression during hospital care.

METHODS

Sample selection

The study population was identified in a previous multi-center study including eight hospitals in central Sweden (2, 3). Forty-two patients, all above the age of 18, who were diagnosed with GBS (14) were followed for two years with repeated evaluations of function, activity and health-related quality of life (2, 3). At about two years after the onset, all 42 patients were sent written information about this qualitative study. After one week, they were telephoned and asked whether they would like to participate based on informed consent. Thirty-five subjects agreed to participate. Seven patients declined, five because they felt uncomfortable with the interview situation and two for unknown reasons. Six of these seven patients were female and the majority were above the age of 65. The study has been approved by the Research ethic committees of all involved hospitals.

Participants

The mean age of the 35 subjects at the onset of GBS was 50 (SD 17, range 20-78 years). Twenty-two subjects were male. Twenty-five subjects (71%) lived with a spouse. Thirty subjects (86%) received immunomodulatory treatment, mainly intravenous immunoglobulin. Nine subjects (26%) were ventilator-treated between 5 to 287 days. A description of ADL-dependency assessed according to an extended Katz ADL-index (15, 16) and working status are presented in Table 1.

Data collection

Data was collected via qualitative interviews that primarily took place in the subjects' homes. The first author conducted all of the interviews and also collected the majority of data of the previous prospective studies (2, 3, 17). Using an interview guide, the interviews were

conducted as conversations with the following three thematic areas: Experience of the onset of GBS, thoughts regarding the diagnosis and illness experiences during hospital care. Follow-up questions were asked depending on how clearly and fully the subjects had answered the main questions. The interviews were taped and transcribed verbatim including pauses and emotional expressions.

Data analysis

A qualitative research approach with both manifest and latent content analysis (18, 19) was conducted. Content analysis focuses on human communication and is suited to research that involves eliciting meaning, interpretations, consequences and context (19). Since there are several methods of content analysis depending on the purpose of the study and nature of the narrative data, each content analysis study must clarify the procedures used (18, 20). In this study, the analysis started with a pilot study with two interviews in order to test the steps of the procedure. This resulted in the following steps:

1. All of the transcribed interviews were read in their entirety to obtain an overall picture.
2. Based on the thematic areas in the interview guide, three content areas (18) emerged in the initial phase of the analysis: Onset of illness, Diagnosis and Illness progression during hospital care. According to Graneheim & Lundman (18), content area can be parts of the text that are based on theoretical assumptions from the literature, or parts of the text that address a specific topic in an interview guide.
3. The interview texts were divided into meaning units, that is, words and statements that are related to the same central meaning.
4. The manifest content analysis was applied when the meaning units were condensed (18, 20). These condensed meaning units were close to the text but shortened in length.
5. In the next step, each meaning unit was labeled according to which content areas it belonged.
6. The latent content analysis (18) began when each condensed meaning unit was interpreted more in-depth and scrutinized for its latent content. This interpretation was in turn expressed as preliminary themes. Preliminary themes that reflected similar underlying meanings were considered sub-theme (18) which were then organized in a higher-order structure so that sub-themes composed the building blocks of more comprehensive themes.
7. Trustworthiness of the analyzing process was guaranteed through critical judgment. All authors read the interviews and reflected on the steps in the analysis. The analyses were discussed in several meetings, which resulted in the refinement of sub-themes and themes.

The order in which the themes in each content area are presented below reflects the number of statements included in the different themes starting with the theme that contained the most statements.

RESULTS

Onset of illness

Two themes were found, with variations in the sub-themes (Table 2) where the onset of illness was described as either an *Incomprehensible, prolonged, increasing deterioration* or as a *Frightening, rapid onset*. The subjects with a prolonged onset described the initial stage as starting out with puzzling sensations in the body, such as tingling, numbness and hypersensitivity. In the beginning, these sensations could disappear for hours before coming back. One subject described it as, " *-I had a strange feeling in my feet, my soles felt thick and*

then, it went quite fast, within a couple of weeks my balance was bad and I started to stumble."
The tingling was experienced as particularly unpleasant, making it difficult to sleep. Several subjects contacted their primary care physician at this stage. They described a startling weakness in the feet, legs and hands. "*My feet felt like they were asleep*" was a common statement. More and more the body became a stranger that they could not trust. A few subjects tried to ignore the strangeness of their bodies, but others came up with explanations such as being tired or overworked. The subjects described a growing awareness that something was wrong as these sensations increased over the following days and in a few cases, over weeks. Several subjects described a feeling of incomprehensible illness with sweating, lack of appetite and tiredness. Some subjects were also afraid that they might have a more familiar disease such as cancer or multiple sclerosis. The uncertainty was overwhelming for many and affected their whole lives.

The *Frightening, rapid onset* was described as a sudden weakness, especially in the legs (Table 2). Difficulty walking was often the first sign, with stumbling and falling episodes. The onset of rapid progressive paralysis took only hours for some subjects before they had to seek medical care, but for others it took a few days. The rapid onset was described thus by one subject, " *-In the morning I felt numbness in one hand, and in the afternoon I could not swallow. By midnight, I could not breathe and was taken to intensive care for ventilator support.*"

Most of the subjects described feelings of fear when they suddenly lost control of their bodies. They were shocked to suddenly be helpless and not able to do ordinary things such as scratching one's nose. The subjects described a fear of dying when the paralysis attacked the respiratory muscles resulting in difficulty breathing. Several subjects had facial muscle paresis that made it difficult to speak. A few subjects experienced pain in the feet or back. This unexpected illness overwhelmed body and mind, and some subjects had difficulty remembering this period because they were confused and severely ill. Those with a frightening onset had a strong desire for an explanation as to why they were hit by this disease.

Diagnosis
There was one main theme in the statements regarding the diagnosis, the *Confidence of recovery* (Table 3). All subjects were unfamiliar with GBS before the start of the illness and were therefore unable to relate their symptoms to others' experiences and levels of recovery. They had to rely on the information given to them by physicians and other hospital staff. A few searched the Internet for information or tried to find it in medical books, but in this early phase of GBS most were too ill to be able to use such sources of information. The information given by physicians and hospital staff was reassuring overall, that is, the subjects were told that the prognosis was good and that most patients recover almost completely. The subjects held on to this reassuring information like a life buoy during this confusing and troubling period. They chose to focus on the good prognosis, and could not at that time foresee a situation in which they would not recover. This reassuring information was a relief when the paralysis increased, as happened for some subjects. Plain and reassuring information about the course of the disease made many subjects feel secure during the early stages. They knew that the paralysis could affect their respiratory muscles and that mechanical ventilation could be necessary.
" *-They told me that the course is positive for nine out of ten patients, so most recover completely. I got the feeling that now it is just to be strong and then everything will be fine.*"

Some subjects also describe feelings of *Worry and chock* over the diagnosis (Table 3). They were given information that residual deficits are common and this made them doubt that they would ever get well. Falling ill with an unfamiliar disease was scary for some subjects. A couple of subjects describe a growing awareness soon after the diagnosis, that recovery would take a long time and that this made them disappointed and sad.
"*-A physician told med that I could get worse, but that I would be completely well again within five years. Five years felt like an eternity and made me worry.*"

A couple of subjects described that they *Felt too ill to care about the diagnosis* or the prognosis. They described a lack of energy that lasted a couple of weeks and being overwhelmingly tired and dazed. A few had difficulty recalling this period of time because it was all in a haze.
" I didn't think about the diagnosis. Now it feels strange that I didn't worry about it, but I was so dazed and tired."

Illness progression during hospital care
For most of the subjects, deterioration continued and the illness peaked during their hospital care. The feelings of *Fear and insecurity in a vulnerable situation* was evident (Table 4) and expressed as a fear of getting worse. They became more paralyzed and several lost basic body functions such as eating and going to the toilet on their own. Several subjects described the frightening experience of not being able to care for oneself. Some subjects talked about being handicapped and losing their identity as an independent person. Decreased body function brought on feelings of helplessness and shame, especially when needing help with hygiene.
" *-It became worse and worse and they gave me a fork and knife that were for handicapped people, and I just screamed and said this can't be for real.*"

The progression in itself and not knowing when it would stop was worrying. A few subjects ignored this obvious deterioration and did not want to accept being struck by a serious disease. About half of the subjects experienced a life-threatening state of health. They noticed that hospital staff was alarmed and prepared for paralysis of respiratory muscles, as there was a readiness for intensive care. All ventilator-treated subjects talked about fear of dying when they experienced a lack of breath.
"*-I had a lot of mucus, and then I felt it was getting harder to breathe. Several nurses and doctors came and tried to suction away the mucus but it did not help. I just lay there and thought I was going to die.*"

An immense feeling of abandonment was described when they were not able to communicate for weeks, or only could do so with great effort. The hope of recovery was their only refuge and helped them endure this stage. Feelings of insecurity were heightened when they were moved to another ward. Leaving well-known staff was frustrating but also gave them increased hope.

The majority of the subjects described a *Distinct, hopeful improvement* that went rapidly and steadily. Once the course of disease had turned, functions returned one by one. About half of the subjects could pinpoint a distinct turning point in the course of GBS. Some experienced an improvement after immunomodulatory treatment, while others talked about suddenly being able to move a hand or a foot. This was a relief and gave them reinforced hope. For some subjects even daily improvements were noticeable. Leaving the wheelchair was for several subjects a huge step forward, and later being able to walk without a technical aid. Some

subjects describe with satisfaction that they surprised the hospital staff, relatives and friends with their sudden improvement. To become more independent was inspiring and made them more diligent with rehabilitation.
" -*…and then when I started to exercise and discovered that I could stand up, everything went very fast.*"

In contrast, some subjects expressed doubts in this early stage of hospital care-about recovery due to an *Alarmingly slow recovery*. Having a very serious disease and the fact that recovery would take time was becoming a realization, while others in the same situation still continued to rely heavily on the prospect of a positive prognosis. A fear of residual problems was evident, especially regarding continued facial paralysis or inability to walk. One subject said, "*It was strange with the paresis in the face. The scariest thing about it was that it might not go away.*"
A few spoke of their growing fear that they would need to remain in the hospital for a long period. The statements reflected a sadness that much of their lives had to be spent being ill with GBS.

Most of the subjects experienced *Strange, bodily sensations*, that were often unpleasant. The body was referred to as '*unreal*'. With increasing numbness or paralysis, the body felt dead and unusable. The muscles felt strange and different when trying to move a leg or an arm.
" -*Something strange happened to my body. I could not feel my arms lying on the bed. It felt like they were floating.*"

Other common sensations were pain and numbness. Several subjects experienced annoying and intense pain. One subject described it as, " -*having an iron on my face.*" A few had such intense pain in the face, but mostly the pain was due to soreness from being bedridden or started when bodily functions returned. However, a couple of subjects expressed that they did not mind the paralysis because there was no pain involved. Numbness was felt distally in the arms and legs, and was described as annoying and strange. Altogether, it made it difficult for some to sleep. Some subjects suffered from constipation due to immobility and pain medication and felt deathly sick. For a couple of subjects the discomfort of having constipation, which overshadowed the paralysis, was the worst. The ventilator-treated subjects all talked vividly about the nauseating and often disgusting experience of mucus suctioning which had to be done several times a day. It was an unpleasant experience that remained in their memory, even after two years.

Experiences of mental sensations were common. Half of the ventilator-treated subjects were plagued by hallucinations that were horrible and made them anxious and fearful. The subjects could describe the hallucinations vividly even after two years.
" -*I have very strong memories of how I am in a situation where the hospital staff wanted to kill me because they felt sorry for me being so ill.*"

Several subjects felt dazed during this early phase in hospital and some described it as being in a bubble. A feeling of exhaustion and overwhelming tiredness was also present. They had to spend a lot of time resting.

DISCUSSION
This qualitative study describes the personal experiences of falling ill with GBS. The participants were all affected differently by GBS, ranging from having mild to severe symptoms. This is evident in the interview data, which encompasses a wide range of

experiences. The interview statements regarding the onset were divided into the two distinct themes described in the results section. Descriptions of an incomprehensible deterioration with puzzling sensations are also found in autobiographies (11-13). At first, these strange sensations were ignored but after a couple of days the feelings of illness increased. Experiences of a sudden onset of a loss of body functions are comparable to experiences of stroke. Burton (21) found that the overwhelming nature of stroke onset precipitated feelings of immense uncertainty and fear, very similar to the feelings found in this study. The progressive paralysis in GBS also threatened breathing, which caused a fear of suffocating in the participating patients.

The majority of the subjects were given a positive prognosis when diagnosed. During the bewildering days of paralysis, this prognosis acted as a life buoy for many. Hospital staff supplied reassuring information about an almost complete recovery, which the subjects clung to. In situations where security and health are threatened, it is natural to focus on hope for recovery, a phenomenon also seen in stroke studies (22). In the first weeks after the diagnosis, hope intensified as body functions started to return. In GBS, as in stroke (21, 22), hope is an important feature of the early recovery phase because there is a potential for rapid recovery. Considerably fewer subjects expressed anxiety of having to endure a long recovery period during the initial phase. Feelings of chock and not knowing what to expect were conveyed in these cases. GBS is in general an unfamiliar disease, which increases the importance of the information delivered by hospital staff. Other studies have raised the issue of the importance of appropriate medical information and its positive effects on wellbeing (5) and satisfaction with care (17).

GBS is a syndrome and therefore the affected individuals may have variable experiences. This is especially evident in the vast number of themes and sub-themes in the “Illness progression during hospital” content area. For instance, a few subjects received a more pessimistic prognosis early in the course of disease. Sometimes the variation in time needed for recovery was evident early on to the hospital staff while the individual still hoped for a full recovery. For patients for whom an incomplete recovery can be suspected, there may be additional demands for early psychosocial support. The subjects with facial paresis distinctly expressed a fear of residual deficits, fearing that this social stigma would be permanent. These findings stress the need to handle the affected GBS patients as individuals who have their own unique illness trajectory. But there are also general points of view in the data such as encountering helplessness and being in a vulnerable situation when having GBS. In addition, several of the statements included shame of being dependent on others with regards to hygiene. Cooke & Orb (5) described the feeling of physical helplessness as being associated with emotional instability. Therefore, psychosocial support may need to be incorporated in care for patients that suddenly lose their autonomy.

Hallucinations were a common experience for the ventilator-treated subjects. This is in line with other research on intensive care where nightmares, disorientation and unreal experiences are associated with fear (23-25). Löf et al (24) found that the comprehensive and detailed memories remained a year after the patient’s stay in intensive care. Anxiety and disorientation were also found to be common during intensive care for GBS patients (6, 7). Loss of the means of communication was in this case the most stressful condition (7), an issue also detected in the current study. Intubation entailed mucus suctioning that many described as a very unpleasant and sometimes horrible experience. Several subjects expressed a need to discuss their experiences of intensive care and to visit the ward again.

The subjects experienced a variety of bodily sensations. Subjects with severe paralysis described the body as '*unreal*'. The feeling of detachment from the body is also described in stroke-victims (21). Dissociation from the body and limited possibilities to act were effects of the paralysis found in the GBS subject. This experience has been similarly described by severely ill patients (26). Other bodily sensations were sleep deprivation, pain and constipation. All of these were major problems that interfered with the patients' general health and recovery.

This heterogeneous sample strengthens the transferability of the data, that is, the extent to which the findings can be considered applicable to other GBS patients. The credibility or the trustworthiness of the results was addressed via investigator triangulation (27) in that all authors took active part in the analysis of the data.

The subjects were familiar with the interviewer from the previous prospective studies (2, 3), which resulted in a relaxed atmosphere. The two-year time lapse from the onset may have affected the subjects' memories of their illness experience, but earlier studies suggest that negative emotional events are well-retained in the memory (28) and easily recalled (29). Falling ill with GBS may be regarded as a highly emotional event.

In conclusion, the findings of this qualitative study suggest that the onset of GBS is characterized by an incomprehensible prolonged deterioration or a frightening, rapid paralysis. Falling ill with GBS involves a hope for recovery that for many patients is reinforced by the steady pace of recovery. In contrast, an alarmingly slow recovery becomes a reality for some patients early in the course of the disease, necessitating early psychosocial support.

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Table 1. *Descriptions of activities of daily living (ADL) and working status; before the onset of Guillain-Barré syndrome, at 2 weeks and at 2 years after the onset*

	Numbers (%)		
	Before onset	2 weeks	2 years
Dependent in personal ADL	0	27 (77)	4 (11)
Dependent in instrumental ADL	1 (3)	34 (97)	8 (23)
Working or studying	23 (66)	0	16 (46)
Unemployed	2 (6)	0	0
Retired due to age	6 (17)	6 (17)	9 (25)
Sick leave or retired due to illness	4 (11)	29 (83)	10 (29)

Table 2. *Experiences of the onset of Guillain-Barré syndrome*

Themes • Sub-themes
Incomprehensible, prolonged, increasing deterioration
• Puzzling sensations in the body, such as tingling and numbness
• The body felt strange and abnormal
• Increasing awareness that something was wrong
• Symptoms increased over a number of days and weeks
• Increasing feeling of illness
• Fear and anxiety
Frightening, rapid onset
• Sudden inability to walk
• Fast progressive paralysis
• Loss of body control
• Fear of dying
• Difficulty speaking
• Body and mind overwhelmed by illness
• Daze and difficulty remembering
• Hope for an explanation

Table 3. *Experiences of the diagnosis*

Themes • Sub-themes
Confidence of recovery
• Relied on given information
• Chose to focus on the fact that most patients recover
• Reassuring information was a relief and gave hope
• Felt secure during the course of disease through plain information
Worry and chock
• Doubtfulness about getting well
• Feelings of fear and chock over an unfamiliar disease
• Increasing awareness of a slow, incomplete recovery
Felt too ill to care about the diagnosis
• Lack of energy
• Overwhelmingly tired and dazed

Table 4. *Experiences during the illness progression at the hospital*

Themes
• Sub-themes
Fear and insecurity in a vulnerable situation
• Fear of getting worse
• A continued deterioration
• Frightening to lose body functions
• Helplessness and shame
• Life-threatening state of health
• Feeling isolated due to limited communication
• Insecurity when being moved to another ward
Distinct, hopeful improvement
• Reassured by rapid and steady improvement
• Distinct turning-point was a relief
• Increasing independency inspired joy and hope
Alarmingly slow recovery
• Prolonged time before start of recovery caused doubt
• Growing awareness of having a serious disease
• Fear of residual deficits
Strange bodily sensations
• The body felt unreal
• Hurt by pain
• Numbness considered annoying
• Felt deathly sick from constipation
• Increased mucus and suctioning considered unpleasant
Experiences of mental sensations
• Scary hallucinations
• Dazed
• Feelings of exhaustion