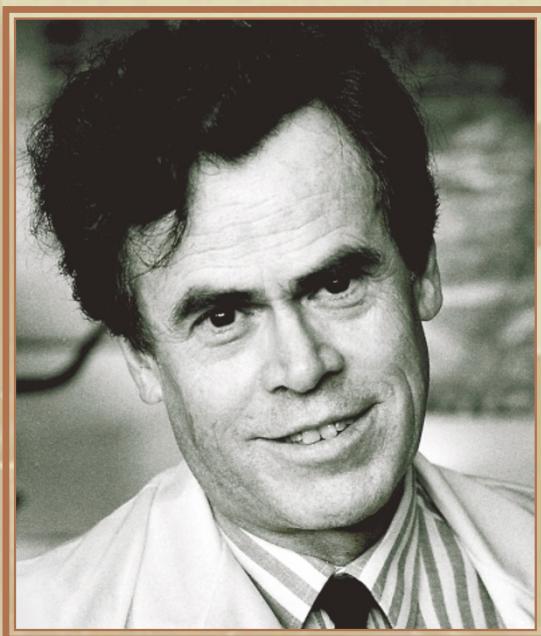


THE LARS SULLIVAN MEMORIAL FUND

1996



THE FUND PROMOTES RESEARCH AND EDUCATION RELATING
TO SPINAL CORD INJURY, ITS TREATMENT AND RELATED PROBLEMS.

"Lars Sullivan was a pioneer in the treatment and rehabilitation of spinal cord injured in Scandinavia. He was convinced that acute treatment and rehabilitation should take place in a comprehensive spinal unit according to the original ideas of Sir Ludwig Guttmann. In Gothenburg he put his ideas into practice when he opened the first, and still the only, Scandinavian comprehensive spinal unit at Sahlgrenska Hospital in 1983. With Lars as head and inspirator this unit has functioned as a model for all other attempts to modernize and improve the care of spinal cord injured people in the Nordic countries."

from: Obituary. Spinal Cord (1996) 34, 365

The Lars Sullivan Award 2000

It is a pleasure to announce the result of The Lars Sullivan Award for 2000. This prize is awarded to the oral or poster presentation that best adheres to the idea of comprehensive system care of spinal cord injuries and is a prize of US\$1,000. An international panel consisting of the President of the IMSOP, the Honorary Treasurer and one person representing the Trustees of the Fund judged who should have the award. The decision was made that the prize should go to M Smith from Sir George Bedbrook Spinal Injuries Unit, Perth, Australia for his paper on *Efficacy of specialist versus non-specialist management of spinal injury within the UK* (see below).

Efficacy of specialist *versus* non-specialist management of spinal cord injury within the UK²

M Smith*,¹

¹Sir George Bedbrook Spinal Injuries Unit, Royal Perth Rehabilitation Hospital, Shenton Park, Perth, WA 6008, Western Australia

Study design: Retrospective outcome measurement study.

Objectives: Spinal cord injury (SCI) represents a life changing multi-factorial event for persons sustaining this condition. There has been anecdotal evidence that some persons sustaining this condition in the UK have not been managed within one of the 11 national specialist spinal injury units (SIU) but rather are managed in non-specialist rehabilitation areas. This study aimed to ascertain if differences in outcome from health, functional and social perspectives exists between the two cohorts.

Setting: All participants had received rehabilitation within the UK National Health Service.

Method: A sample of 800 participants were recruited from the database of the Spinal Injury Association (UK) to complete a postal, self reporting questionnaire ascertaining perceived outcome across all of these perspectives.

Results: Despite having more severe injuries, the SIU cohort demonstrated statistically significant improved outcomes in 10 out of 18 health outcomes, 16 out of 18 functional outcomes and five out of 10 social outcomes in comparison with the non-SIU cohort.

Conclusion: This study provides the evidence that people with SCI are better managed through a specialist system. Should a like for like comparison have been made as regards severity (completeness) of injury, the likelihood is that the results would have been even more in favour of the SIU cohort. These results should encourage commissioners of health care and those working in trauma settings to ensure people with SCI are managed in a specialist spinal injury unit setting both nationally and internationally.

Spinal Cord (2002) **40**, 11–16. DOI: 10.1038/sj/sc/3101226

Keywords: spinal cord injury; rehabilitation; outcome measurement; specialist centres

Introduction

Spinal cord injury (SCI) is a multi-system, multi-factorial, life changing event for any individual. The impact of SCI on an individual may be viewed from physiological or functional aspects, or from the opportunity or ability an individual has to undertake desired societal roles.

Measurement of such variables in health care after delivery of services is now commonplace within rehabilitation and in health care generally, however it appears rare that such outcomes across all of the aforementioned perspectives are measured. A failure to do this with a multifaceted injury such as SCI, will provide an incomplete picture for those tasked to review and plan services and processes to achieve optimum outcomes.

There are 12 specialist spinal injury units (SIU) in the UK and Ireland, the aim of which, is to provide a comprehensive service which manages the impact

*Correspondence: M Smith, Sir George Bedbrook Spinal Injuries Unit, Royal Perth Rehabilitation Hospital, Shenton Park, Perth, WA 6008, Western Australia

²This paper is based on the Lars Sullivan lecture IMSOP 2000, Sydney, Australia

of SCI immediately following acute injury, through rehabilitation to a meaningful discharge back into the community. It is clear however that some people with SCI do not have the opportunity to access this system but are managed in a non-specialist environment, commonly orthopaedic or general rehabilitation areas. There has been anecdotal evidence for some time suggesting that outcomes for those managed in a non-specialist system do not match those who utilise the spinal injury unit systems. No study which measures the efficacy of specialist *versus* non-specialist management of SCI has previously been performed in the UK. The primary question investigated within this study was to ascertain whether a positive difference in outcome from physiological, functional and social perspectives for the individual with SCI actually exists in those managed through a specialist spinal unit compared to those who were managed through non-specialist systems.

Method

The self selecting sample were recruited through Spinal Injuries Association (UK) (SIA) newsletter 'Forward'. A self-reporting questionnaire was utilised, with considerations made regarding language used ie terminology familiar to those with SCI. A grid format was predominantly used for responses, to accommodate for potential limited hand function of respondents, although there was the necessity for a limited number of free text sections. The questionnaire was piloted (12 people) to ensure appropriate language and clarity of questions posed, and distributed with the SIA newsletter. Demographic information was requested regarding age, gender,

injury cause, level and severity, location of rehabilitation and length of hospitalisation. The measuring tool aimed to measure outcome from health, functional and social perspectives. Comparison of all these outcomes between SIU and non-SIU cohorts was to be made.

Health

Eighteen common secondary complications occurring following spinal cord injury were identified from the literature¹⁻³ and the author's previous experience of SCI having worked in the speciality for the previous 10 years, clinically within two specialist units and in related academic positions (Table 1). The sample were asked to indicate if they had experienced each within the last 2 years.

Functional outcome

Three outcomes were to be investigated: (a) In what activities of daily life did the participants require assistance, and how much? (b) How much paid/unpaid assistance did participants actually receive? (c) Were participants in control of, and satisfied with, the assistance required?

When scaling the level of assistance required, the Functional Independence Measure (FIM)⁴ is designed for recording by health care professionals and requires a formal training programme prior to implementation in an attempt to maximise reliability of responses. As the project required participants to self-report, the number of categories was reduced to an ordinal scale with only four potential responses ie 0, <50%, >50%, 100% assistance required. Although some items were based

Table 1 Percentage incidence of health complications in tetraplegics and paraplegics for SIU and non-SIU groups

% incidence	Tetraplegic -SIU	Tetraplegic -non SIU	Signif.	Paraplegic -SIU	Paraplegic -non SIU	Signif.
Pressure mark on skin	46.2	68.6	<i>P</i> =0.034	44.2	54.0	<i>P</i> =0.185
Superficial surface pressure sore	32.0	48.6	<i>P</i> =0.871	31.9	44.8	<i>P</i> =0.135
Deep pressure sore	11.2	22.9	<i>P</i> =0.07	14.8	11.1	<i>P</i> =0.257
Deep vein thrombosis	1.5	2.9	<i>P</i> =0.591	3.5	4.8	<i>P</i> =0.609
Chest infection	36.9	60.0	<i>P</i> =0.02	20.1	28.6	<i>P</i> =0.05
Urinary tract infection	64.3	80.0	<i>P</i> =0.039	65.7	76.2	<i>P</i> =0.039
Constipation	48.6	60.0	<i>P</i> =0.367	44.3	66.7	<i>P</i> =0.001
Diarrhoea	32.3	31.4	<i>P</i> =0.641	33.8	42.9	<i>P</i> =0.125
Regular shoulder pain	49.2	50.0	<i>P</i> =0.964	40.0	54.0	<i>P</i> =0.05
Regular abdominal pain	28.4	40.0	<i>P</i> =0.05	22.2	46.0	<i>P</i> <0.001
Wound infection	10.6	14.3	<i>P</i> =0.6	12.5	12.7	<i>P</i> =0.875
Uncontrolled autonomic dysreflexia	22.1	42.9	<i>P</i> =0.014	6.0	10.0	<i>P</i> =0.076
Problematic spasm	39.0	40.0	<i>P</i> =0.871	31.9	60.3	<i>P</i> <0.001
Poor sleep pattern	46.4	43.9	<i>P</i> =0.992	38.3	57.1	<i>P</i> =0.001
Syringomyelia	3.0	2.9	<i>P</i> =0.919	4.9	1.7	<i>P</i> =0.08
Severe depression	13.6	17.1	<i>P</i> =0.672	15.9	31.7	<i>P</i> =0.001
Relationship problems with partner	13.8	8.6	<i>P</i> =0.974	17.7	27.0	<i>P</i> =0.001
Relationship problems with family/ friends	10.6	11.4	<i>P</i> =0.329	10.8	23.8	<i>P</i> =0.01

on FIM, to facilitate self-reporting by participants and comprehensiveness, the language was changed and other items altered to encompass other activities not covered by FIM, making a total of 18 items examined (Table 2).

Social activity

Based on dimensions of societal function ie occupation, mobility and social integration and some elements of the CHART (Craig Handicap Assessment and Recording Technique),⁵ 10 key variables relating to social activity were examined (Table 3).

Life satisfaction

For the purposes of this study two other key elements required additional exploration beyond the information already collected. Firstly an indication of how people felt now and whether that had changed over time utilising a simple four-point fixed choice scale. Secondly the areas of most and least satisfaction were examined within a free-text section, respondents being requested to provide up to five areas for each also stating best and worst. These were post-coded following data collection.

Data analysis was performed using SPSS statistical software package. Statistical significance was set at $P < 0.05$.

Results

Of the sample meeting the inclusion criteria ($n = 800$) 13.6% ($n = 99$) had not utilised an SIU system. Comparison of the sample through statistical analysis using a *t*-test demonstrated no significant difference in age or date of injury between the SIU and non-SIU cohorts. Utilising a Chi-square test, significant differences in severity ($P < 0.001$) the non-SIU group had less severe injuries, gender ($P = 0.002$) and cause ($P < 0.001$) as the non-SIU cohort had a greater number of females and SCI of non-traumatic origin. In view of this further analysis utilising logistic regression was performed on the data as appropriate to adjust for these other variables.

Health outcome

Chi-square test was performed exploring whether a statistically significant difference existed between the two cohorts. Logistic regression was utilised on those that demonstrated significance. Table 1 illustrates percentage incidence in all the complications explored, and indicates a statistically significant lower incidence in the SIU cohort in five and 10 of the 18 within the tetraplegic and paraplegic groups following analysis. Additionally, there was a statistically significant lower incidence of superficial pressure sore ($P = 0.048$) within the SIU cohort, when taking the sample as a whole.

Results – functional outcome

Within activities explored the SIU cohort required a lower percentage level of assistance. Using a Mann-Whitney *U*-test, of the 18 activities, at statistically significant lower level of assistance was demonstrated in three activities for the whole tetraplegic group and 15 for the paraplegic group (Table 2). Additionally, when examining those with complete tetraplegic only, a further three activities proved significant ie in grooming ($P = 0.004$), eating ($P = 0.001$), and drinking ($P < 0.001$).

Chi square analysis demonstrated a positive outcome related to satisfaction of the amount of assistance received in the SIU cohort ($P = 0.017$).

Results – social activity

Ten key social indicators were suitable for statistical analysis (Table 3). Again percentage differences suggested better outcomes for the SIU cohort. Statistical significance was demonstrated in three areas specifically within the paraplegic group. Additionally, analysis of the sample as a whole indicated the SIU cohort were more likely to have a partner ($P = 0.012$), be in paid employment ($P = 0.017$) or in voluntary employment ($P = 0.025$). Males with SCI in the SIU cohort were more satisfied with sex, in both the tetraplegic ($P = 0.006$) and paraplegic ($P = 0.05$) groups.

Life satisfaction

There was no statistical significance demonstrated in general life satisfaction between the two cohorts ($P = 0.07$). The life areas that respondents appeared to be most satisfied with were similar and tended to have a social focus eg family, friends, social life. Slight differences were raised in the areas of least satisfaction with 10% more of the non-SIU sample raising 'health' as an issue. This seems congruent with the statistically significant differences demonstrated in the health section. Pain was noted by over 12% of the sample as a poor life area. The fact that this was ranked the worst area in the non-SIU group and second worst in the SIU cohort is indicative of chronic pain following SCI remaining a complex and most difficult situation to manage.

Discussion

The evidence demonstrates that health outcomes are improved for those going through a specialist SIU system. The implications for individuals and for increased utilisation of health care services for those not attending an SIU must be substantial. However, the incidence of some complications remains high, and there is no room for complacency within SIU's. Greater collaboration between spinal injury units both national and internationally is needed, not only to facilitate cross centre working and development of

Table 2 Level of assistance required with various functional activities in SIU and non-SIU groups (all figures expressed as percentage)

	Eating			Drinking			Grooming			Dressing upper body			Managing bladder			Managing bowels		
Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	
0	55.4	51.4	0	68.3	45.7	0	59.3	48.6	0	30.4	28.6	0	32.3	14.3	0	23.8	20.0	
<50	29.5	14.3	<50	16.9	25.7	<50	11.8	11.4	<50	16.4	17.1	<50	12.8	22.9	<50	3.9	17.2	
>50	6.0	8.6	>50	4.8	0.0	>50	10.5	5.7	>50	18.8	11.4	>50	16.8	17.1	>50	19.6	11.4	
100	9.1	25.7	100	10.0	28.6	100	18.4	34.3	100	34.4	42.9	100	38.1	45.7	100	52.7	51.4	
P=0.01		P=0.001			P=0.197			P=0.893			P=0.305			P=0.472				
Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	
0	99.2	96.8	0	98.9	96.8	0	98.4	87.1	0	90.2	71.4	0	83.2	71.0	0	83.4	67.7	
<50	0.5	1.6	<50	1.1	1.6	<50	0.8	8.1	<50	6.3	20.6	<50	9.5	17.7	<50	9.3	16.1	
>50	0.3	1.6	>50	0.0	1.6	>50	0.5	3.2	>50	2.4	3.2	>50	4.1	9.7	>50	2.7	9.7	
100	0.0	0.0	100	0.0	0.0	100	0.3	1.6	100	1.1	4.8	100	3.2	1.6	100	4.6	6.5	
P=0.1		P=0.179			P<0.001			P<0.001			P=0.047			P=0.014				
	Showering			Car transfer			Toilet transfer			Bed to chair transfer			Entering house			Housework		
Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	
0	18.4	8.6	0	30.9	18.2	0	32.5	23.3	0	29.4	18.2	0	45.9	28.6	0	4.6	0	
<50	13.8	11.4	<50	13.8	15.1	<50	8.4	6.7	<50	12.4	12.1	<50	13.1	25.7	<50	14.9	17.1	
>50	29.8	28.6	>50	15.1	9.1	>50	15.0	13.3	>50	17.0	12.1	>50	10.9	20.0	>50	31.0	28.6	
100	38.0	51.4	100	40.2	57.6	100	44.1	56.7	100	41.2	57.6	100	30.1	25.7	100	49.5	54.3	
P=0.215		P=0.175			P=0.413			P=0.211			P=0.543			P=0.924				
Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	
0	61.7	30.2	0	76.0	60.3	0	83.3	75.4	0	80.8	65.1	0	82.1	69.8	0	31.3	15.9	
<50	23.4	42.9	<50	16.9	17.5	<50	9.5	16.4	<50	12.5	20.6	<50	10.6	17.5	<50	28.3	33.3	
>50	11.6	19.0	>50	3.8	14.3	>50	4.0	4.9	>50	3.5	6.4	>50	4.1	9.5	>50	30.8	36.5	
100	3.3	7.9	100	3.3	7.9	100	3.2	3.3	100	3.2	7.9	100	3.2	3.2	100	9.6	14.3	
P<0.001		P=0.014			P=0.240			P=0.014			P=0.04			P=0.05				
	Dressing lower body			W/chair outdoors			W/chair indoors			Driving			Laundry			Shopping		
Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	Tetraplegia	SIU	NonSIU	
0	22.3	17.1	0	30.9	31.4	0	68.0	39.4	0	36.1	22.9	0	15.8	8.6	0	16.7	2.8	
<50	6.6	14.3	<50	23.5	11.4	<50	16.1	18.2	<50	7.6	17.1	<50	12.2	14.2	<50	13.6	14.3	
>50	21.4	20.0	>50	26.3	22.9	>50	4.3	12.1	>50	13.8	11.4	>50	23.5	28.6	>50	31.5	34.3	
100	49.7	48.6	100	19.3	34.3	100	11.6	30.3	100	42.5	48.6	100	48.5	48.6	100	38.2	48.6	
P=0.611		P=0.435			P=0.001			P=0.551			P=0.886			P=0.23				
Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	Paraplegia	SIU	NonSIU	
0	74.3	42.9	0	58.9	41.9	0	92.1	75.4	0	73.7	54.8	0	51.5	25.8	0	44.5	28.6	
<50	15.4	34.9	<50	28.9	32.3	<50	6.0	14.8	<50	10.4	14.5	<50	20.7	38.7	<50	28.7	34.9	
>50	6.2	11.1	>50	9.5	16.1	>50	1.1	4.9	>50	7.7	9.7	>50	18.4	24.2	>50	20.8	22.2	
100	4.1	11.1	100	2.7	9.7	100	0.8	4.9	100	8.2	21.0	100	9.4	11.3	100	6.0	14.3	
P<0.001		P=0.007			P<0.001			P=0.005			P=0.011			P=0.043				

Table 3 Levels of social activity (expressed as percentages)

<i>Paid Employment</i>						<i>Unpaid Employment</i>											
Tetraplegia		<i>P</i> =0.12		Paraplegia		<i>P</i> =0.045		Tetraplegia		<i>P</i> =0.15		Paraplegia		<i>P</i> =0.106			
Hours	SIU	Non-SIU	Hours	SIU	Non-SIU	Hours	SIU	Non-SIU	Hours	SIU	Non-SIU	Hours	SIU	Non-SIU			
0	71.5	82.4	0	64.5	75.8	0	70.5	61.8	0	75.0	63.9	0	75.0	63.9			
1–12	5.2	2.9	1–12	4.1	4.8	1–12	21.0	29.5	1–12	17.8	26.2	1–12	17.8	26.2			
13–24	3.6	2.9	13–24	3.6	4.8	13–24	4.9	2.9	13–24	4.2	4.9	13–24	4.2	4.9			
25–36	3.0	2.9	25–36	5.2	4.8	25–36	3.0	2.9	25–36	1.1	1.7	25–36	1.1	1.7			
>36	16.7	8.9	>36	22.6	9.7	>36	0.6	2.8	>36	1.9	3.3	>36	1.9	3.3			
<i>Hours per day out of bed</i>																	
Tetraplegia		<i>P</i> =0.686		Paraplegia		<i>P</i> =0.056		Tetraplegia		<i>P</i> =0.829		Paraplegia		<i>P</i> =0.05			
Hours	SIU	Non-SIU	Hours	SIU	Non-SIU	Hours	SIU	Non-SIU	Hours	SIU	Non-SIU	Hours	SIU	Non-SIU			
0	0.0	0.0	0	0.3	0.0	0	2.5	2.9	0	2.2	3.2	0	2.2	3.2			
1–5	0.9	0.0	1–5	1.1	0.0	1–5	14.1	8.5	1–5	10.6	14.5	1–5	10.6	14.5			
6–10	11.8	17.1	6–10	8.3	16.1	6–10	20.5	28.6	6–10	10.7	24.2	6–10	10.7	24.2			
11–15	61.2	62.9	11–15	52.6	53.2	11–15	13.2	20.0	11–15	15.6	8.1	11–15	15.6	8.1			
>15	26.1	20.0	>15	37.7	30.7	>15	49.7	40.0	>15	60.9	50.0	>15	60.9	50.0			
<i>Drives/Control when driven</i>																	
Tetraplegia		<i>P</i> =0.677		Paraplegia		<i>P</i> =0.001		Tetraplegia		<i>P</i> =0.48		Paraplegia		<i>P</i> =0.38			
Yes	SIU	Non-SIU	Yes	SIU	Non-SIU	Yes	SIU	Non-SIU	Yes	SIU	Non-SIU	Yes	SIU	Non-SIU			
Yes	74.8	76.5	Yes	91.1	70.7	Yes	52.8	63.0	Yes	51.8	50.8	Yes	47.2	37.0	No	48.2	49.2
No	25.2	23.5	No	8.9	29.3	No	47.2	37.0	No	48.2	49.2	No	47.2	37.0	No	48.2	49.2
<i>Contacted friends</i>																	
Tetraplegia		<i>P</i> =0.931		Paraplegia		<i>P</i> =0.191		Tetraplegia		<i>P</i> =0.701		Paraplegia		<i>P</i> =0.167			
Hours	SIU	Non-SIU	Hours	SIU	Non-SIU	Hours	SIU	Non-SIU	Hours	SIU	Non-SIU	Hours	SIU	Non-SIU			
0	2.7	0.0	0	1.4	4.7	0	21.5	20.6	0	19.3	15.9	0	21.5	20.6	0	19.3	15.9
1–5	20.5	20.0	1–5	18.6	18.7	1–5	43.2	41.2	1–5	36.5	52.4	1–5	43.2	41.2	1–5	36.5	52.4
6–10	21.5	37.1	6–10	23.0	23.4	6–10	22.7	20.6	6–10	24.9	12.7	6–10	22.7	20.6	6–10	24.9	12.7
11–15	14.2	5.8	11–15	14.5	9.4	11–15	2.8	8.8	11–15	6.1	4.7	11–15	2.8	8.8	>15	13.2	14.3
>15	41.1	37.1	>15	42.5	43.8	>15	9.8	8.8	>15	13.2	14.3	>15	9.8	8.8	>15	13.2	14.3
<i>Have a partner</i>																	
Tetraplegia		<i>P</i> =0.157		Paraplegia		<i>P</i> =0.124		Tetraplegia		<i>P</i> =0.114		Paraplegia		<i>P</i> =0.577			
Yes	SIU	Non-SIU	Yes	SIU	Non-SIU	Yes	SIU	Non-SIU	Yes	SIU	Non-SIU	Yes	SIU	Non-SIU			
Yes	59.1	50.0	Yes	65.3	54.1	Yes	36.5	25.0	Yes	38.9	36.4	Yes	54.4	64.3	No	53.6	58.2
No	40.9	50.0	No	34.7	45.9	No	9.1	10.7	No	7.5	5.4	No	9.1	10.7	N/A	7.5	5.4

services, but also to create the necessary critical mass of people with SCI with which to undertake meaningful research to impact on further improvements in outcome.

From the functional perspective, once again the evidence is highly suggestive that those utilising an SIU system have improved outcomes. The extent to which this was the case was surprising, as the non-SIU cohort had less severe injuries, and therefore one would expect better functional outcomes. A comparison of exact ‘like for like’ may well have provided further statistical significance in favour of the SIU cohort. Again this has personal and economic implications, with the need for more paid assistance in the community for those who are less able.

From the social perspective, the investigator expected little differences to exist between cohorts as the main focus of SIU, as immediate rehabilitation post injury has traditionally had a health and functional focus. Although there appears to be a change to

models of rehabilitation delivery which focus more on the reintegration of the individual in his or her community, it may take some time before this impacts more fully on social activity. However, the positive outcomes demonstrated in the SIU cohort provides evidence that utilisation of an SIU system is desirable. Employment levels remain exceptionally poor not only in this population, but for those with physical disabilities generally. The problems created by environmental and attitudinal barriers need to be addressed at social policy level, not only regarding employment but also other access and opportunity issues which limit social opportunity.

Clearly there is much scope for future research across all of the perspectives examined. The author is currently re-examining the same data as a whole sample to investigate where relationships may exist between health, function and social activity eg between health and employment. Reasons for the high level of complications apart from the physiological changes

following SCI requires investigation, eg are such individuals educated but choose not to comply with methods to minimise the likelihood of the development of such complications due to potential impact on other life activities? The economic impact requires investigation, as use of resources for health care in this population is surely not optimised in the treatment of such health problems.

As discussed previously the continually disturbing employment statistics for this population require further investigation and radical action.

Conclusion

This study has provided conclusive evidence that from health, functional and social perspectives an individual should be managed in a specialist SIU system. This is despite the fact that the SIU cohort showed a more significant severity of injury. Should a like for like comparison have been made as regards severity (completeness) of injury, the likelihood is that the results would have been even more in favour of the SIU cohort. Within the UK, responsibility for ensuring people are referred to a spinal unit must rest with commissioners of health care. The message must get through to referring hospitals not only through dissemination of this study, but also through directives from health authorities to hospitals in their region. From an international perspective those countries developing systems designed to meet the needs of the spinal cord injured, in the light of this evidence, should ensure specific specialist systems are developed.

Acknowledgements

Prof Martin Ferguson-Pell, PhD, ASPIRE Chair Disability and Technology, University College London, Royal National Orthopaedic Hospital Trust. Mr Shak Hajit, Statistician, Royal Free Hospital Trust. Mr Brian Gardner, MA FRCP FRCS, Clinical Director, National Spinal Injuries Centre, Stoke Mandeville Hospital Trust. All participants in the project who offered their personal and expert perspectives on living with SCI.

References

- 1 Whiteneck G *et al.* Mortality, mobility, and psychosocial outcomes of persons spinal cord injured more than 20 years ago. *Paraplegia* 1992; **30**: 617–630.
- 2 Vaidyanathan S *et al.* A review of the readmissions of patients with tetraplegia to the regional spinal injuries centre, Southport, United Kingdom between January 1994 and December 1995. *Spinal Cord* 1998; **36**: 838–846.
- 3 Johnson RL *et al.* Secondary complications following spinal cord injury in a population based sample. *Spinal Cord* 1998; **36**: 45–50.
- 4 Hamilton B *et al.* A uniform national data system for medical rehabilitation. In: Fuhrer MJ (ed). *Rehabilitation outcomes analysis and measurement*. Baltimore: Brooks, 1987.
- 5 Whiteneck G *et al.* Quantifying handicap, a new measure of long term outcomes. *Archives of Physical and Medical Rehabilitation* 1992; **73**: 519–526.