

Title:

Mapping the rehabilitation interventions of a community stroke team to the Extended International Classification of Functioning, Disability and Health Core Set for Stroke

Abstract:

Purpose: This study aim was to evaluate if the Extended International Classification of Functioning, Disability and Health Core Set for Stroke captured the interventions of a community stroke rehabilitation team situated in a large city in New Zealand. It was proposed that the results would identify the contribution of each discipline, and the gaps and differences in service provision to Māori and non-Māori. Applying the Extended International Classification of Functioning, Disability and Health Core Set for Stroke in this way would also inform whether this core set should be adopted in New Zealand.

Method: Interventions were retrospectively extracted from 18 medical records and linked to the International Classification of Functioning, Disability and Health and the Extended International Classification of Functioning, Disability and Health Core Set for Stroke. The frequencies of linked interventions and the health discipline providing the intervention were calculated.

Results: Analysis revealed that 98.8% of interventions provided by the rehabilitation team could be linked to the Extended International Classification of Functioning, Disability and Health Core Set for Stroke, with more interventions for body function and structure than for activities and participation, no interventions for emotional concerns and limited interventions for community, social and civic life. Results support previous recommendations for additions to the EICSS.

Conclusions: The results support the use of the Extended International Classification of Functioning, Disability and Health Core Set for Stroke in New Zealand, and demonstrates its

use as a quality assurance tool that can evaluate the scope and practice of a rehabilitation service.

Introduction

The International Classification of Functioning Health and Disability (ICF) provides a common international language that enables the collection and comparison of rehabilitation research data [1]. In order to encourage the use of the ICF in clinical settings, core sets were developed and are defined as selected categories that represent key functional problems of people with a particular condition or problems specific to a certain stage of the condition [2-4]. The Extended International Classification of Functioning Disability and Health Core Set for Stroke (EICSS) has 166 categories and is compiled from three core sets; the ICF Neurological Core Set for patients with Neurological Conditions in Acute Hospital [5], the ICF Core Set for patients with Neurological Conditions in Early Post-Acute Rehabilitation Facilities [6] and the Comprehensive Core Set for Stroke [7]. The EICSS thus represents the whole experience of a person with stroke, rather than a specific time period, and as a result can be used in any health setting [8].

On reviewing the studies that contributed to the development of the EICSS, several issues were found that could affect its validity and use in community stroke rehabilitation. Firstly, patient data used in the development of the three core sets were based on interviews with patients who were in hospital rather than in community settings [9-11]. Secondly, the preliminary research supporting the EICSS and the consensus conference which selected categories for the EICSS had a higher representation from medical professionals compared to allied health professionals [7, 12]. Consequently, the Comprehensive ICF Core Set for Stroke may be biased towards the inclusion of body function and body structure categories compared to the other domains and may not capture the experience of people living with stroke in the community. Thirdly, the data gained from patients and health professionals used to develop

the EICSS came from participants situated in Germany and Austria. Therefore, the EICSS may not represent different cultures and health systems where it may be used.

Despite these criticisms, three studies of the EICSS [8, 13, 14] and one of the Comprehensive ICF Core Set for Stroke [15] have demonstrated that the EICSS has sufficient content validity from the patient perspective.

Although the content of the EICSS is largely confirmed, both the patient and health professional validity studies have identified missing categories. Physicians, physiotherapists, and occupational therapists all reported that ICF category *b765 involuntary movement*, should be included and noted the absence of categories related to neglect, posture and patient education in both the ICF and EICSS [16-18]. In addition, both physiotherapy and occupational therapy professionals thought the following six ICF categories needed to be included in the EICSS: *b720 mobility of bone functions*, *s760 structure of the trunk*, *s770 additional musculoskeletal structures*, *d435 moving objects with the lower extremity*, *d650 caring for household objects* and *e140 products and technology for culture recreation and sport* [16, 17].

Glässer et al. [8] identified 31 missing categories not present in the EICSS but present in the ICF. One concept 'reaction time' was considered to be missing in both the EICSS and the ICF. For the Comprehensive ICF Core Set for Stroke, 11 categories have been identified as missing but present in the ICF [15]. From the research to date, while it appears that the EICSS represents the key functional problems for people with stroke in the community, further research is needed to evaluate the importance of the missing categories and whether they need to be included in the EICSS.

Although Stucki et al., [19] have suggested that the ICF could be used for quality assurance and benchmarking, only two studies using the International Classification for Functioning Disability and Health for Children and Youth have linked assessments and interventions of a rehabilitation service to the ICF [20, 21]. Both studies report this process identified gaps in service provision, with both services having a greater focus on body function concerns rather

than activities and participation. No studies have yet linked the interventions of a community stroke service to the EICSS.

The study objective was to map the community stroke interventions onto the ICF and EICSS to identify if the interventions were represented either by the EICSS or ICF. It was proposed that such a comparison would provide feedback to the community stroke team on whether they were providing interventions to address all patient needs and whether there were differences in the interventions provided to Māori and non-Māori.

Method

This retrospective observational study reviewed 18 medical records from a community stroke rehabilitation service. The service provides rehabilitation in people's homes for patients who are 65 years or over who have had a stroke and are identified as being frail or needing rehabilitation. It is staffed by a manager, two occupational therapists, two physiotherapists, a speech therapist, dietician, and social worker, ten therapy assistants and a part-time nurse. A psychologist and geriatrician are accessed by referral.

Māori are the indigenous people of New Zealand and make up 15 % of the population. They are 1.3 times more likely to have a stroke than non-Māori and on average Māori have a stroke 15 years earlier than non-Māori [22, 23]. As a result of these known disparities, it was decided to compare equal numbers of Māori and non-Māori records to explore if there were differences in the provision of community stroke rehabilitation [24].

A research assistant worked backwards from November 2011 to November 2010 to select the first 9 Māori and 9 non-Māori patient records. The selection criteria applied were people aged over 65 years, who had primary diagnosis of cortical or subcortical stroke with no significant co-morbidities, and had received rehabilitation from two or more health professionals in the community stroke rehabilitation service [25].

Characteristics of the patients at entry to the service were recorded, including age, gender, right or left hemiplegia, cognitive and communication impairment, Barthel Index score [26] which indicates level of dependence, and whether the patient was living with family.

Interventions and the health professional providing them were extracted from each medical record and linked to the most specific ICF and EICSS code using the linking rules developed by Cieza et al. [27].

The selected records resulted in a large number of interventions to code (>1300). Therefore as this was a small feasibility study the resources did not permit a larger number of patient records or the use of two independent coders. Consequently it was not possible to check the reliability of coding using Kappa statistics. Coding interventions was done by the author who is an occupational therapist with four years' work experience in community stroke rehabilitation. To improve reliability coding decisions from the first three records coded and difficult coding decisions were discussed with the rehabilitation team and with the second and third authors who have professional backgrounds in physiotherapy and occupational therapy. Feedback from these discussions helped form a coding guideline, which was used to check the consistency of all coding decisions. The coding guideline is provided in Table 1. Using an Excel spreadsheet (version 14.0.7172.5000) the frequencies of coded interventions were calculated for each intervention, each health profession, and for Māori and non-Māori.

Insert table 1 here

The ICF is organised so that categories with a similar concept are placed under chapter headings. This structure was used to amalgamate the frequency data from the 166 EICSS intervention linked categories under 26 chapter heading or sub headings. These headings were used in the tables and enabled the comparison of the EICSS linked interventions for Māori and non-Māori and for health professionals.

Ethical approval for the study was gained from the District Health Board, the funder and manager of the service, the New Zealand Ministry of Health's Northern X Regional Ethics Committee and the Auckland University of Technology Ethics Committee.

Results

As seen in table 2, the average age of the 18 patients was 73 years old, 11 were female and 7 male, 8 had a right cerebrovascular accident and 10 a left cerebrovascular accident. Māori were on average younger than non-Māori (69 years old compared to 78 years old) and all Māori were living with family. From the admission assessments, Māori had lower Barthel Index scores, indicating higher disability, and higher levels of cognitive and communication impairment than non-Māori.

Insert table 2 here

All the 1,361 interventions could be coded to the ICF and 98.8% could be coded to the EICSS. The 16 ICF coded interventions that could not be coded to the EICSS were *b820 repair functions of the skin* (1), *s760 structure of the trunk* (5), *d660 assisting others* (9), and *e535 communication services, systems and policies* (1). As seen in table 3, the highest percentage of interventions were coded in the body function domain (40.1 %), followed by activities and participation (36.7%), the environment (22.5%) and body structure (0.8%).

Insert table 3 here

In total, 71 out of a possible 166 EICSS categories were linked to interventions. In the body function domain 25 out of 59 categories were linked, with no categories linked for the chapter 2 categories of sensory functions or chapter 6 genitourinary and reproductive functions. In the body structures domain, 2 out of 11 categories were linked, with no categories linked to

chapter 1, structure of the nervous system, chapter 4, cardiovascular, haematological, immunological and respiratory functions, and chapter 5 digestive functions. In the activity and participation domain, 27 out of 59 categories were linked, with no categories for chapter 7 interpersonal interactions and relationships. In the environmental factor domain 17 out of 37 categories were linked, with no categories linked to chapter 2 natural environment and chapter 4 attitudes.

Overall, non-Māori received more interventions than Māori (713 vs 632). Māori received proportionally fewer interventions for activities and participation and more interventions for the environment than non-Māori.

Tables 4, 5, and 6 present the number and percentage of interventions linked to each EICSS category and chapter. The most frequently provided interventions were: *b730 muscle power* (10.7%), *d460 moving around in different locations* (8.6%), *d440 fine hand use* (8.5%), *b760 control of voluntary movement* (7.6%), *d410 changing basic body position* (7.1%) and *e120 products and technology for personal mobility* (5.7%).

Insert tables 4, 5, and 6 here

Health professionals by intervention

To generate meaningful findings, the categories were condensed under 26 headings that reflected the content of the data and the chapter headings of the EICSS (figure 1). Using these broad headings, table 7 presents the most frequent types of interventions provided by each health professional in the community stroke team. The most frequent interventions for each profession were, physiotherapists (walking and moving 6.8%), occupational therapists (specific mental functions 6.4%), speech therapists (specific mental functions 2.2%), dietician (digestive functions 0.4%), social worker (services, systems and policies 1.1%), therapy assistant (carrying and handling 7.3%) and nurse (support and relationships 0.9%).

Insert figure 1 here

There were 18 out of 26 headings in which several professions are contributing to a shared rehabilitation aim. Out of all the professions, occupational therapy appeared to be providing the widest scope of interventions with 10 intervention areas compared to six intervention areas for physiotherapy. See table 7.

Insert table 7 here

Discussion

The results show the majority (98.8%) of community stroke interventions were represented by the codes of the EICSS. Consequently, these results support its use in community stroke rehabilitation services in New Zealand. The three categories in this study that were not covered by the EICSS but are found in the ICF, have also been found relevant in other studies; *s760 structure of the trunk*, *d660 assisting others* and *e535 communication services, systems and policies* which supports the recommendations of previous researchers for these categories to be included in the EICSS [8, 16, 17].

Overall, there were more interventions for body function than activities and participation (40.1% vs 36.7%). Breaking that figure down by ethnicity, Māori had more body function than activities and participation interventions (19.8% vs 14.3), and non-Māori had more activities and participation than body function interventions (20.3% vs 22.3%). The higher body function interventions for Māori may reflect the higher impairment levels of Māori compared to non-Māori as indicated by their Barthel scores (11.87 vs 18). From informal feedback to the reported findings, therapists expressed the view that an improvement in body function skills would enable patients to achieve competence in activities and participation. This way of thinking assumes linear connections between body function and activities and participation without consideration of the bidirectional interactions of the ICF, whereby involvement in activities and participation can improve body functions and structures [28].

Activities and participation

There were no interventions recorded for *b152 emotional functions*, *d710 basic interpersonal functions*, *d750 informal social relationships*, *d760 family relationships* and *d770 intimate relationships*, and only one intervention coded to *d240 handling stress*. This is an important omission as previous studies have highlighted these areas as key issues for people with stroke. Riberto et al. [14] found that of 132 people receiving stroke outpatient services, 51.9%, reported problems with emotional functions, 20.2 % with basic interpersonal relationships, 26.6% with informal social relationships, 26.6 % with intimate relationships and 52.3% with handling stress and other psychological demands. A study of 99 Swedish people with stroke found although basic interpersonal problems were not significant at 6 weeks and 3 months post stroke, handling stress and other psychological demands was significant at both time points [13]. The need for interventions for emotional concerns is also supported by Allen et al. [29] who found that at one year post stroke 31.7% of patients were classified as depressed. In relation to the community stroke team under study, it is noteworthy that no interventions were provided by a psychologist, possibly because this staff member was not on site.

In this study only 0.3 % of all interventions were directed at *d920 recreation and leisure*. Nonetheless patients report that social participation is a problem after stroke. Riberto et al. [14] found that 47.5% of patients considered they had problems with *d910 community life*, and 66.0% with *d920 recreation and leisure*. This was also found to be of concern for 39 of 99 Swedish people 3 months post stroke [13]. In this study, it is unclear why so few interventions were reported for chapter 9 community, social and civic life or why more interventions for activities and participation were provided for non-Māori than Māori. This result indicates a disparity in service provision that needs further investigation.

Environmental Factor categories

In contrast to previous studies, the categories for chapter (2) Natural environment and chapter (4) Attitudes were absent [8, 14] and this may reflect the different method used in this study.

Previous studies identified environmental facilitators and barriers from an interview whereas in this study environmental factors were interventions that had an environmental impact and were jointly identified by the health professional and patient. Consequently, the therapist may have chosen to address environmental issues that can be changed within the bounds of the health system rather than attempt to change the more difficult issues such as attitudes and the natural environment. The most frequent environmental factor intervention was *e120 products and technology for personal mobility* (5.7%). This result differs from a similar study which found the most frequent environmental facilitator was *e540 social security systems, services and policies* (95.5%) [13]. These differences may reflect the unique health and social systems of the country where the study was conducted.

Health professionals

The service used therapy assistants to provide therapy under the guidance of an allied health professional. This practice follows the recommendation by the Rehabilitation Service and Workforce Forecast (2011)[30] to use therapy assistants to enable the delivery of high doses of rehabilitation. In this study therapy assistants provided the most activity and participation interventions, with 7.3 % of interventions for carrying and handling. The interventions provided by each health profession align with traditional discipline roles, although there were a similar number of interventions provided by physiotherapy and occupational therapy for muscle functions (6.1% compared to 5.1%). This result supports a previous research finding that identified that both occupational therapists and physiotherapists provide intervention to improve selective movement, mobilization, exercise and sitting balance [31]. From reading the patient records it was evident that role division was occurring with occupational therapists treating upper limb impairment, and physiotherapists lower limb impairment. This observation is supported by Richards et al. (2009) [32] who found occupational therapists in inpatient stroke facilities spent 35.5% of their time improving upper limb control. As the EICSS does not provide specific body function codes for the upper limb for muscle power, tone,

endurance and coordination, it is difficult to explore this role division in more depth.

Consequently, these results may reflect the lack of sensitivity of the EICSS rather than health professionals having duplicate roles.

Strengths and limitations

Patient notes appeared to be written in a consistent manner. Given the retrospective nature of the study, therapists' recording of interventions were not influenced by being part of a research project, suggesting the notes were an accurate record of the interventions provided.

The small sample of patient notes and the fact they were not chosen randomly means that the results cannot be generalised to other community stroke rehabilitation services. Only one researcher identified and linked the interventions to the EICSS which may have reduced the reliability of the results. However, coding decisions were discussed by the team, which will have enhanced the consistency of coding.

Conclusion

This study has found that the EICSS represents most interventions provided by a community stroke team in New Zealand, thus supporting the adoption of the EICSS in New Zealand. This research has demonstrated that mapping interventions to the EICSS can identify service gaps and therefore supports its use as a quality assurance tool. In this case the findings indicated that this service provided very limited interventions for emotional and relationship issues and comparatively lower number of activities and participation interventions to Māori. Such feedback provides a basis for re-evaluating service provision and identifying staff development needs, with the ultimate aim of improving the outcomes of people living with stroke in the community. This result supports previous recommendations for revision of the EICSS, and adds weight to the previous findings about health care disparities in New Zealand.

Declaration of interest: The authors report no declarations of interest.

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Table 1, Coding guideline for difficult coding

Intervention	Code
1. When the aim of the intervention is not clear from notes	The closest code to the intent of the words
2. What is an intervention	Only interventions that have been carried out with the patient not referrals to other services
3. When there are multiple concepts in an intervention	The primary idea, for example “family to seek funding from tribe, re fixing front steps”, only code funding and steps
4. Visual scanning	b156 perceptual functioning and awareness of body and space
5. Education regarding knowledge about condition	b1644 insight
6. Stretching exercises when tone is not mentioned	b7101 mobility of several joints
7. Interventions extending or grading up exercises or reviewing exercises	b7301 power of muscles of one limb or b1701 mobility of several joints
8. Upper limb exercise with visualisation	b7301 improving power of one limb
9. When wording refers to prompting a physical skill e.g. with prompt client able to control drift of arm	b7600 control of movement
10. Gait re-education	b770 gait pattern functions
11. Positioning a person to reduce swelling	s7302 structure of the hand, code was chosen to reflect the intent of maintaining the range of movement in the hand
12. Learning a compensatory strategy	d1550 learning a strategy or skill
13. Giving information to address a particular problem	d175 problem solving
14. Providing information on a communication group	d330 speaking
15. Rolling in bed	d4100 lying down, getting into and out of lying position

Intervention	Code
16. Getting into and out of seated position	d4103 sitting
17. Sliding transfers	d4200 moving from a sitting position on one seat to another seat on the same or a different level
18. Walking up to one kilometre outside	d4500 walking for less than a kilometre outside
19. Walking indoors	d4600 moving around within the home
20. Walking outdoors	d4602 moving around outside the home and other buildings
21. Assistive equipment used when preparing meals	d6300 preparing simple meals and e1151 assistive products for personal use in daily living
22. Education given to family, or care giver so that they are able to provide better care to the client	d660 assisting others

Table 2, Demographic and clinical characteristics of the sample

	Māori	Non-Māori	Total sample
	(n=9)	(n=9)	(n=18)
Women	6	5	11
Average age	69	78	73
Average No. of weeks rehabilitation	16.1	14.8	13.7
Impaired communication	6	4	10
Barthel average score	11.87	18	13.8
Impaired cognition	7	4	11
Right hemiparesis	4	4	8
Living with family	9	4	4

Table 3, Total frequency and percentage of interventions linked to the EICSS

ICF component	EICSS	Māori EICSS	Non-Māori EICSS
Body function	539 (40.1%)	266 (19.8%)	273 (20.3%)
Body structure	11 (0.8%)	4 (0.3%)	7 (0.5%)
Activities and participation	493 (36.7%)	193 (14.3%)	300 (22.3%)
Environment	302 (22.5%)	169 (12.6%)	33 (9.9%)
Total	1345 (98.8%)	632 (47.0%)	713 (53.0%)

Table 4, Total number of interventions coded against each EICSS category for body function and structure.

Chapter blocks present in the data	EICSS category	No.	% of total count
Body Function			
1. Global mental functions	b110 consciousness	1	0.1
	b134 sleep	1	0.1
1. Specific mental functions	b140 attention	17	1.3
	b144 memory	17	1.3
	b156 perceptual	2	0.1
	b156 perceptual and awareness of the body and space	40	3.0
	b160 thought	3	0.2
	b164 higher level cognitive	44	3.3
	b167 mental functions of language	22	1.6
	b172 calculation	6	0.5
	b176 mental functions of sequencing complex movements	2	0.1
3. Voice and speech functions	b320 articulation	9	0.76
	b330 fluency and rhythm of speech	1	0.1
4. Functions of the cardiovascular system and respiratory systems	b420 blood pressure	4	0.3
	b450 additional respiratory functions	3	0.2
	b455 exercise tolerance	6	0.4
5. Functions of the digestive system	b510 ingestion	4	0.3
	b530 weight maintenance	7	0.5
7. Functions of the joints and bones	b710 mobility of joints	21	1.6
7. Muscle functions	b730 muscle power	144	10.7
	b735 muscle tone	3	0.2
	b740 muscle endurance	28	2.1
7. Movement functions	b755 involuntary movement	34	2.5
	b760 control of voluntary movement	102	7.6
	b770 gait pattern	13	1.0
8. Function of the skin	b810 protective functions of skin	5	0.4
Body Structure			
7. Upper extremity	s730 structure of upper extremity	10	0.7
7. Lower extremity	S750 structure of the lower extremity	1	0.1

Table 5, Total frequencies of interventions coded against each EICSS category for activities and participation

Chapters and chapter blocks present in the data	EICSS category	No.	% of total count
1. Basic learning	d155 acquiring skills	11	0.8
1. Applying knowledge	d175 solving problems	2	0.1
2. General tasks and demands	d240 handling stress	1	0.1
3. Communication	d310 receiving spoken messages	1	0.1
	d325 receiving written messages	2	0.1
	d330 speaking	2	0.1
	d345 writing messages	2	0.1
	d350 conversation	2	0.1
	d360 using communication devices	2	0.1
4. Mobility: Changing & maintaining body position	d410 changing basic body position	95	7.1
	d415 maintaining body position	3	0.2
	d420 transferring oneself	8	0.6
4. Mobility: Carrying and handling	d430 lifting & carrying objects	6	0.4
	d440 fine hand use	114	8.5
	d445 hand and arm	33	2.5
4. Mobility: Walking and moving	d450 walking	4	0.3
	d455 moving around, by means other than walking	9	0.7
	d460 moving around in different locations	115	8.6
4. Mobility: Driving	d475 driving	12	0.9
5. Self-care	d510 washing oneself	6	0.4
	d540 dressing	11	0.8
	d560 drinking	2	0.1
	d570 looking after one's health	20	1.5
6. House hold tasks	d630 preparing meals	10	0.7
	d640 doing house work	14	1.0
8. Work	d850 remunerative employment	2	0.1
9. Community social and civic life	d920 recreation and leisure	4	0.3

Table 6, Total frequencies of interventions coded against each EICSS category for the environment

Chapters and chapter blocks present in the data	EICSS category	No.	% of total count
1. Products and technology	e110 products for personal consumption	3	0.2
	e115 products for personal use in ADL	42	3.1
	e120 products and technology for personal mobility	76	5.7
	e155 design and construction of buildings for private use	19	1.4
	e165 assets	4	0.3
3. Supports and relationships	e310 immediate family	23	1.7
	e340 personal care providers and assistants	28	2.1
	e355 health professionals	34	2.5
	e360 other professionals	2	0.1
5. Services systems and policies	e515 architecture and construction services, systems & policies	1	0.1
	e525 housing services, systems & policies	5	0.4
	e540 transportation services systems & policies	5	0.4
	e550 legal services systems & policies	2	0.1
	e555 Associations organisations services, systems & policies	7	0.5
	e570 social security services system & policies	9	0.7
	e575 general social support services systems & policies	2	0.1
	e580 health services, systems & policies	40	3.0

Figure 1, Total frequency of EICSS codes under 26 headings

Table 7, Most common Interventions for each profession

Profession	Interventions linked to EICSS headings
Physiotherapy	(A&P) Walking and moving 6.8% (BF) Muscle functions 6.1% (BF) Movement functions 6.1% (A&P) Changing and maintaining position 4.2% (E) Products and technology 3.6% (BF) Specific mental functions 1.9% (E) Support and relationships 1.9%
Occupational therapy	(BF) Specific mental functions 6.4% (E) Products and technology 5.9% (BF) Muscle functions 5.1% (A&P) Carrying and handling 3.8% (BF) Movement functions 3.6% (E) Services, systems and policies 3.5% (E) Support and relationships 3.0% (A&P) Change and maintain position 2.6% (A&P) Self-care 1.9% (A&P) House hold tasks 1.1%
Therapy Assistant	(A&P) Carrying and handling 7.3% (BF) Muscle functions 1.8% (A&P) Walking and moving 1.7% (BF) Movement functions 1.3% (A&P) Change and maintain positions 1.0%
Speech therapist	(BF) Specific mental functions 2.2%
Dietician	(BF) Digestive functions 0.4%
Social worker	(E) Services, systems and policies 1.1%
Nurse	(E) Support and relationships 0.9%

Key: % of total interventions provided by the team

