Current Practices of Physical and Occupational Therapists Regarding Spasticity Assessment and Treatment

Andréanne K. Blanchette, PhD, PT;^{*†} Marika Demers, MSc, OT;^{‡§} Kathleen Woo;^{‡§}
Akash Shah, MPT;[¶] John M. Solomon, PhD, PT;[¶] Aditi A. Mullick, MPT;^{‡§}
Mindy F. Levin, PhD, PT;^{‡§}

ABSTRACT

Purpose: The purpose of this study was to understand current trends in rehabilitation practice regarding spasticity assessment and treatment. **Method:** The clinical practices of Canadian physiotherapists and occupational therapists in assessing and treating spasticity were investigated using a self-administered, Web-based questionnaire (cross-sectional design). Experienced clinicians developed the questionnaire, which surveyed socio-demographic characteristics, work environment, and clinician satisfaction with spasticity assessments and preferences for treatment. **Results:** A total of 317 clinicians (204 physiotherapists and 113 occupational therapists) completed the questionnaire. The majority of participants reported that using valid and reliable outcome measures to assess spasticity was important (91.1%). Most clinicians indicated using a combination of spasticity assessments, and their level of satisfaction with these assessments was very high. All clinicians believed that spasticity should be evaluated by rehabilitation professionals, and most indicated that it should be assessed by more than one professional. Although 83.8% indicated that spasticity should be tested on admission, a much lower percentage believed that it should be evaluated throughout rehabilitation. Most clinicians (92.2%) reported using multiple treatment modalities for spasticity. **Conclusions:** This study is the first to document clinicians' practices regarding spasticity assessment and treatment. A better understanding of current trends in physiotherapy and occupational therapy will help in tailoring strategies to improve practice.

Key Words: neurological rehabilitation; neurology; occupational therapy; spasticity; survey; symptom assessment.

RÉSUMÉ

Objectif: comprendre les tendances actuelles des pratiques de réadaptation en matière d'évaluation et de traitement de la spasticité. **Méthodologie:** les chercheurs ont exploré les pratiques cliniques des physiothérapeutes et des ergothérapeutes canadiens pour évaluer et traiter la spasticité au moyen d'un questionnaire virtuel autoadministré (étude transversale). Des cliniciens d'expérience ont préparé le questionnaire, qui sondait les caractéristiques sociodémographiques, le milieu de travail et la satisfaction des cliniciens à l'égard des évaluations de la spasticité et des préférences thérapeutiques. **Résultats:** au total, 317 cliniciens (204 physiothérapeutes et 113 ergothérapeutes) ont rempli le questionnaire. La majorité des participants (91,1 %) ont déclaré qu'il était important d'utiliser des mesures de résultats valides et fiables pour évaluer la spasticité. La plupart des cliniciens ont indiqué utiliser une combinaison d'évaluations de la spasticité et être hautement satisfaits de la qualité de ces évaluations. Tous les cliniciens ont mentionné que la spasticité devrait être évaluée par des professionnels de la réadaptation, et la plupart ont précisé qu'elle devrait l'être par plus d'un professionnel. Bien que 83,8 % aient indiqué que la spasticité devrait être évaluée à l'admission, un pourcentage beaucoup plus faible a mentionné qu'elle devrait l'être tout au long de la réadaptation. La plupart des cliniciens (92,2 %) ont déclaré utiliser de multiples modalités thérapeutiques pour intervenir auprès d'individus présentant de la spasticité. **Conclusions:** la présente étude est la première à porter sur les pratiques des cliniciens en matière d'évaluation et de traitement de la spasticité. Une meilleure compréhension des tendances actuelles en physiothérapie et en ergothérapie contribuera à adapter des stratégies afin d'améliorer la pratique.

Spasticity is an impairment¹ commonly observed in individuals with neurological disorders such as stroke, traumatic brain injury, spinal cord injury, cerebral palsy, and multiple sclerosis. *Spasticity* is defined as "a motor disorder characterized by a velocity-dependent increase in tonic stretch reflexes ('muscle tone') with exaggerated tendon jerks, resulting from hyperexcitability of the stretch

reflex."^{2(p.485)} It is estimated that 12 million people around the world are affected by spasticity. More specifically, 84% of individuals with multiple sclerosis³ and 89% of individuals with cerebral palsy⁴ experience various degrees of spasticity. The prevalence ranges from 19% to 43% in individuals with stroke⁵ and from 67% to 78% in individuals with spinal cord injury.^{6,7} Spasticity substantially

From the: ^{*}Department of Rehabilitation, Université Laval; [†]Centre for Interdisciplinary Research in Rehabilitation and Social Integration, Quebec City; [‡]School of Physical and Occupational Therapy, McGill University; [§]Feil and Oberfeld Research Centre, Jewish Rehabilitation Hospital, Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal, Montreal, Que.; [¶]Department of Physiotherapy, School of Allied Health Sciences, Manipal University, Manipal, India.

Correspondence to: Andreanne K. Blanchette, Department of Rehabilitation, Université Laval, 1050 ave. de la Médecine, VND-4472, Quebec City, QC G1V 0A6; andreanne.blanchette@fmed.ulaval.ca.

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affects individuals' ability to perform daily activities as well as their levels of social participation and health-related quality of life.⁵

Because of the significant impact of spasticity on activities of daily living, managing this impairment is an important component of neurological rehabilitation. Keeping in mind that spasticity assessments and treatments may differ across rehabilitation disciplines, a multidisciplinary team approach is necessary because it ensures that all strategies are available, thus optimizing patients' rehabilitation.⁸

Approaches to management of spasticity include medical (e.g., oral medication, intrathecal pumps, intramuscular injections, surgical interventions)⁹ and physical (e.g., muscle stretching, orthotics, casting, muscle strength training, electrical stimulation, vibratory stimuli, and muscle cooling) interventions.^{8,10} Evidence regarding the most effective physical treatment modality to reduce spasticity is conflicting and, in general, no single treatment modality can successfully manage spasticity in all individuals.^{11–13}

Successful management of spasticity relies on a treatment plan that is based on accurate clinical patient assessment,¹¹ and using standardized measures is crucial.¹⁴ Valid and reliable outcome measures can help quantify and qualify the severity of spasticity, evaluate its progression over time, and determine the effectiveness of the therapy. In light of this, several clinical practice guidelines have recommended using valid and reliable tools to assess spasticity.^{12,15,16} However, whether these guidelines have been implemented in clinical practice and what effect their implementation may have on patient care is unknown.

Ultimately, to tailor strategies to promote implementation of the recommendations of clinical practice guidelines and improve practice, it is important to understand the current trends in rehabilitation practice with respect to assessing and treating spasticity. To address this question, we surveyed the clinical practices of physiotherapists and occupational therapists, working with individuals with neurological disorders in assessing and treating spasticity. Preliminary results have been published in abstract form.¹⁷

METHODS

Study design

The study used a cross-sectional, descriptive design. It was part of a larger study that aimed to gain a better understanding of the current trends in rehabilitation practice in managing spasticity in different countries, such as India. We distributed a Web-based questionnaire by email to physiotherapists and occupational therapists across Canada to determine their current practices regarding neurological assessments and treatments.

The study was approved by the Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal

Ethics Committee, and we obtained informed consent from participants before they completed the questionnaire.

Participants

The survey targeted registered professionals who were working with pediatric, adult, or geriatric neurological populations and who were members of the following Canadian associations or provincial regulatory bodies: Physiotherapy Association of British Columbia, Physiotherapy Alberta College and Association, College of Physiotherapists of Ontario, Ordre professionnel de la physiothérapie du Québec, College of Physiotherapists of New Brunswick, Nova Scotia College of Physiotherapists, Canadian Association of Occupational Therapists, Saskatchewan Society of Occupational Therapists, Manitoba Society of Occupational Therapists, and Ordre des ergothérapeutes du Québec. There were no exclusion criteria.

We identified the therapists who met the inclusion criteria by obtaining the associations' member lists, either from their Web sites or by contacting the associations themselves and filtering the lists to find professionals who were working with neurological populations. However, five associations did not distinguish among areas of practice. In addition, six associations sent the invitation email directly to their members to maintain their privacy. We sent an email invitation to the identified professionals, in both French and English, that included a description of the research project, a consent form, and a link to the questionnaire.

Questionnaire

The questionnaire on the current practices of clinicians in assessing and treating spasticity was developed in English by a core group of four expert clinicians. A convenience sample of six additional expert clinicians piloted the questionnaire independently. We asked them to answer specific questions (e.g., "Are some elements unclear, irrelevant, or missing?") and to provide their comments and suggestions. The appropriate modifications were then made to obtain the final version of the questionnaire. It was translated into French by a native French speaker and subsequently revised by two other native French speakers.

The full questionnaire consisted of four sections, but in this article we analyse only three (see online Appendix 1 for the complete questionnaire). Section 1 consisted of multiple-choice questions about the respondents' socio-demographic characteristics: profession, gender, level of training, work hours, clinical neurological experience, and type of clientele treated (age group and phase of recovery, number of patients with spasticity). Section 2 included multiple-choice questions about the work environment: type of setting, work sector (private or public), and geographical location (urban, suburban, or rural). Section 3 included questions about how often participants used standardized neurological assessments and the facilitators and barriers influencing their use (reported

Figure 1 Flowchart describing the data collection procedure.
*Data obtained from the Canadian Institute for Health Information.
OTs = occupational therapists.

elsewhere¹⁸). In Section 4, participants were surveyed about the importance of using validated outcome measures, professional responsibility, and the timing of evaluating spasticity. They were also asked to read a brief case study about an individual who had sustained a stroke and then indicate whether they would assess spasticity in that patient. If respondents indicated that they would not, the questionnaire was terminated. If they indicated that they would, they were asked to indicate which of 12 spasticity assessments they would use and their level of satisfaction with each one. Section 4 also included questions about preferences for using common spasticity treatments. All questions were mandatory.

Data collection

Both the English and the French versions of the questionnaire were hosted on FluidSurveys, version 5.0 (Fluidware, Ottawa, ON). The survey was available to participants for a 10-week period between May and July 2014. When possible, reminders were sent twice, using FluidSurveys, to those who had not completed the survey. A long data collection period, as well as reminders, were the strategies used to minimize non-response bias.

Data analysis

We used only completed questionnaires for data analysis. Questionnaires were considered complete if the four

sections had been answered and consent was obtained (see the flow chart in Figure 1). For participants who did not treat individuals with neurological disorders, the questionnaire was terminated after Sections 1 and 2. Questionnaires were automatically terminated if participants did not indicate their consent at the beginning. We calculated the percentage of responses to each question on the basis of the number of participants who answered each question. Aside from descriptive statistics, comparisons were made using two-proportion *z*-tests and a significance level of $p < 0.05$.

RESULTS

In all, 8,617 individuals were sent an email inviting them to fill out the questionnaire. By the end of the data collection period, we had received 425 questionnaires from physiotherapists and occupational therapists. Among these questionnaires, 317 were complete, 106 were incomplete, and 2 had been terminated (consent not given). This resulted in a response rate of approximately 5.0% and a completion rate of 74.6%. Because it was not possible to discriminate among the areas of practice for some associations, responses from all members were not anticipated. The average completion time was 10.2 minutes (excluding 3 outliers, who completed the questionnaire in > 1 h).

Demographic characteristics

In all, 204 physiotherapists and 113 occupational therapists completed the questionnaire (see Table 1). The sample included clinicians from all provinces except for Prince Edward Island and excluded the northern territories. The study sample also included a large proportion of clinicians from the province of Quebec. The highest degree obtained was most commonly a bachelor's degree, as indicated by 71.0% of respondents. Only a small proportion of respondents had a PhD (1.3%). More than half of the participants (57.7%) had more than 10 years of clinical experience with a neurological clientele. Also, more than half of the participants (56.8%) worked with adults in their practice, and 27.1% worked with children. A smaller proportion of clinicians (16.1%) stated that they worked with both adults and children. Of the 317 respondents who completed the questionnaire, 291 (91.8%) indicated that they were treating individuals with spasticity.

Concerning the work environment, the majority of respondents reported working in the public health care system (92.4%), and almost half (48.9%) worked, more specifically, in a rehabilitation centre. Furthermore, 58.7% of the participants indicated working in urban regions.

Of the completed questionnaires, 42% were submitted in English, and 58% were submitted in French. Although most provinces have residents whose spoken language is mainly English, the large number of respondents from Quebec may explain the distribution.

Spasticity assessment

Respondents who treated patients with spasticity were then asked to indicate who they believed should assess

Table 1 Respondent Sociodemographic Characteristics: Sections 1 and 2

Questionnaire section and characteristic	No. (%) of respondents*	
	Physiotherapists	Occupational therapists
Section 1		
Profession	204 (100.0)	113 (100.0)
Gender		
Female	188 (92.2)	105 (92.9)
Male	16 (7.8)	8 (7.1)
Highest level of professional training		
Diploma	6 (2.9)	1 (0.9)
Bachelor's degree	146 (71.6)	79 (69.9)
Master's degree	49 (24.0)	32 (28.3)
Doctoral degree	3 (1.5)	1 (0.9)
Work hours		
Part time	60 (29.4)	33 (29.2)
Full time (≥ 35 h/wk)	144 (70.6)	80 (70.8)
Clinical experience with neurological clientele		
<1 y	5 (2.5)	6 (5.3)
1–3 y	26 (12.7)	11 (9.7)
4–10 y	52 (25.5)	34 (30.1)
>10 y	121 (59.3)	62 (54.9)
Percentage of patients with neurological deficits		
None	0 (0.0)	0 (0.0)
<30%	49 (24.0)	26 (23.0)
31%–75%	54 (26.5)	41 (36.3)
>75%	101 (49.5)	46 (40.7)
Clientele		
Paediatric (<18 y)	59 (28.9)	27 (23.9)
Adult (≥ 18 y)	107 (52.5)	73 (64.6)
Both	38 (18.6)	13 (11.5)
No. of patients with spasticity seen in a typical month		
None	5 (2.5)	5 (4.4)
<2	42 (20.6)	34 (30.1)
2–5	66 (32.4)	36 (31.9)
6–10	48 (23.5)	16 (14.2)
>10	43 (21.1)	22 (19.5)
Type of neurological patients treated†		
Acute (<1 wk post-lesion)	35 (17.2)	22 (19.5)
Subacute (1 wk–3 mo post-lesion)	104 (51.0)	42 (37.2)
Chronic (≥ 3 mo post-lesion)	152 (74.5)	82 (72.6)
Section 2		
Work setting†		
General hospital	21 (10.3)	14 (12.4)
Acute care hospital	35 (17.2)	16 (14.2)
Extended care facility	5 (2.5)	8 (7.1)
Rehabilitation centre	109 (53.4)	46 (40.7)
Outpatient clinic	32 (15.7)	14 (12.4)
Community	21 (10.3)	15 (13.3)
Home care	23 (11.3)	11 (9.7)
Other	26 (12.7)	11 (9.7)
Work sector		
Private	16 (7.8)	8 (7.1)
Public/government	188 (92.2)	105 (92.9)
Work region		
Urban	116 (56.9)	70 (61.9)
Suburban	49 (24.0)	21 (18.6)
Rural	39 (19.1)	22 (19.5)

*Percentages were based on the total number of completed questionnaires for each profession.

† Respondents could select more than one option.

Figure 2 Opinions of physical and occupational therapists about which health care professionals should assess spasticity.

Note: Percentages were based on the total number of clinicians who treat patients with spasticity in their practice.

OT = occupational therapist; MD = doctor of medicine.

Figure 3 Opinions of physical and occupational therapists about the time points at which spasticity should be assessed.

Note: Percentages were based on the total number of clinicians who treat patients with spasticity in their practice.

spasticity among the different health care professionals (multiple answers were possible). Almost all participants (99.3%) indicated that physiotherapists should perform this task (see Figure 2); other commonly selected answers included neurologists, physiatrists, and physicians (91.4%) as well as occupational therapists (80.4%). Only 4.1% of respondents specified other health care professionals (e.g., kinesiologists, orthotists, speech therapists, orthopaedists, and orthopaedic surgeons) in addition to those suggested by the questionnaire. Physiotherapists, occupational therapists, neurologists, physiatrists, and physicians were all identified as being responsible for assessing spasticity by 69.4% of the respondents.

Spasticity can be assessed at different times during rehabilitation. Most participants (83.8%) believed that it should be assessed when a patient is admitted to rehabilitation services (see Figure 3). The decision to assess spasticity at an interim point, at discharge, and at follow-up was almost evenly divided among the participants;

Figure 4 Opinions of physical and occupational therapists about the importance of using validated and reliable spasticity assessments.

51.9%, 62.5%, and 54.0% of respondents chose these time points, respectively. Comparatively few respondents (15.5%) believed that spasticity should never be assessed during rehabilitation. At all time points (admission, interim, discharge, and follow-up), the proportions differed significantly between clinicians working in a rehabilitation

centre and those working in other clinical settings. Physiotherapists and occupational therapists working in rehabilitation centres were more inclined to assess spasticity at different time points (admission, $z = -2.48$, $p = 0.013$; interim, $z = -2.86$, $p = 0.004$; discharge, $z = -4.44$, $p < 0.001$; follow-up, $z = -2.38$, $p = 0.017$).

When asked how important it was to use validated and reliable spasticity assessments with neurological patients, most participants (91.1%) indicated that it was important (*very important* or *somewhat important*), with a majority selecting *somewhat important* (52.7%; see Figure 4). No differences were found in the perceived importance of using validated or reliable outcome measures among clinicians working with adults or children, among those with more than or less than 10 years of experience, or among those working in urban or rural areas.

Among the 291 clinicians who indicated that they worked with individuals with spasticity, 94.8% reported that they would assess spasticity in the case study patient (Section 4 of online Appendix 1). When participants were asked to identify the assessments that they would use to assess spasticity in this patient (multiple answers could be chosen from the list of 12 options), they selected an average of 4.5 assessments per participant. Figure 5a shows that the five most frequent answers were range of motion (ROM; 96.7%), clonus (83.5%), the Modified Ashworth Scale (MAS; 75.5%), deep tendon reflexes (61.7%), and functional scales (59.9%). More physiotherapists indicated using clonus, the MAS, and deep tendon reflexes to evaluate spasticity, and more occupational therapists indicated using functional scales and

Figure 5 Percentage of respondents using spasticity assessment in their daily practice: (a) all participants and (b) physical and occupational therapists separately.

ROM = range of motion; MAS = Modified Ashworth Scale; DTR = deep tendon reflexes; FS = functional scales; AS = Ashworth Scale; TM = torque measurements; TS = Tardieu Scale; CST = clinical score of tone; SFS = Spasm Frequency Scale; CSI = Composite Spasticity Index.

Figure 6 Frequency of use of (left) and level of satisfaction with (right) (a) original Ashworth Scale and (b) Modified Ashworth Scale.

Table 2 Treatments of Spasticity Used in Clinical Practice

Treatment	No. (%) of respondents*	
	Physiotherapists (n = 193)	Occupational therapists (n = 98)
Prolonged muscle stretching	173 (59.5)	54 (18.6)
Prolonged icing	14 (4.8)	2 (0.7)
Sensory-level stimulation (TENS)	23 (7.9)	7 (2.4)
Motor-level stimulation	120 (41.2)	47 (16.2)
Vibration	39 (13.4)	11 (3.8)
Splinting	146 (50.2)	74 (25.4)
Positioning	181 (62.2)	89 (30.6)
Traction	14 (4.8)	3 (1.0)
Other	76 (26.1)	37 (12.7)

Note: Respondents could select more than one option.

*Percentages were based on the total number of respondents who assessed patients with spasticity in their practice.

TENS = transcutaneous electrical nerve stimulation.

torque measurements (see Figure 5b). A full 27.0% of all participants indicated that they typically used the original version of the Ashworth Scale (AS; Figure 5b), and 75.5% stated that they would use the modified versions.

Clinicians were asked to indicate their level of satisfaction with the assessments that they typically used to assess spasticity. For the five most commonly used

spasticity assessments (ROM, clonus, MAS, deep tendon reflexes, and functional scales), the level of satisfaction was very high, ranging between 87.7% and 94.2%. More specifically, the proportion of respondents who answered *very satisfied* or *somewhat satisfied* was 76.0% for the AS and 91.3% for the MAS (see Figure 6).

Spasticity treatment

The most commonly indicated treatments for spasticity, in descending order, were positioning, prolonged muscle stretching, splinting, motor-level stimulation, other treatment modalities (options not listed), vibration, transcutaneous electrical nerve stimulation (TENS), traction, and prolonged icing (see Table 2). Among other treatments, the most frequently reported were facilitation techniques (approximation or weight bearing, neurodevelopmental treatment or Bobath, proprioceptive neuromuscular facilitation), inhibition techniques (myofascial release), task-oriented training, and strengthening. The majority of participants (92.2%) identified multiple modalities when questioned about which spasticity treatment they would typically use.

When comparing the treatment modality used by clinicians from different professions or working with different types of patients, we noted some differences. A larger percentage of physiotherapists than occupational therapists used muscle stretching (89.6% vs. 54.1%;

$z = 6.88, p < 0.001$), icing (7.2% vs. 1.0%; $z = 2.27, p = 0.023$), and motor-level stimulation (61.1% vs. 47.0%; $z = 2.31, p = 0.021$). Responses also differed among clinicians from the private and public sectors. In the private sector, clinicians had a greater tendency to use TENS (25.0% vs. 8.8%; $z = 2.14, p = 0.032$). The only difference noted when comparing responses from clinicians working exclusively with children or adults was the use of prolonged icing because it was never named as a treatment modality in pediatrics (0.0% vs. 7.9%; $z = -2.58, p = 0.010$).

DISCUSSION

The aim of this study was to investigate the current practices of physiotherapists and occupational therapists working with individuals with neurological disorders in assessing and treating spasticity using a self-administered, Web-based questionnaire. The majority of the participants believed that using valid and reliable outcome measures to assess spasticity was important. All participants believed that spasticity should always be evaluated by rehabilitation professionals (physiotherapists or occupational therapists), and almost all (97.9%) indicated that more than one professional should be responsible for assessing spasticity. Although the majority of participants (83.8%) indicated that spasticity should be incorporated into the initial evaluation, the percentage who thought that spasticity should be evaluated at multiple time points was much lower.

In their daily practice, clinicians indicated using a combination of assessments to evaluate spasticity. The five most frequently identified assessments were ROM, clonus, MAS, deep tendon reflexes, and functional scales. Positioning, prolonged muscle stretching, splinting, and motor-level stimulation were among the treatment modalities most often indicated by the study participants, and most clinicians (92.2%) reported that they used multiple modalities in their clinical practice.

Spasticity assessment

According to the *Canadian Best Practice Recommendations for Stroke Care*, clinicians should use standardized, valid assessment tools to evaluate patient impairments,¹⁶ and our data suggest that the clinicians believed that using such tools was important. This is consistent with the literature, which indicates that clinicians have a positive attitude toward evidence-based practice and the use of validated outcome measures.^{19,20} These results are also compatible with changes made to the physical and occupational therapy curricula in Canadian universities to promote the use of evidence-based practice to future clinicians.

In daily practice, clinicians use a combination of assessments to evaluate spasticity. However, most of these assessments are not specific, and they evaluate the consequences of spasticity rather than its physiological origin

(e.g., deficits in descending pathways, threshold regulation, and reflex pathways). As an example, the MAS remains one of the preferred scales for assessing spasticity, despite its inconsistent reliability.^{21–24} Although there have been many efforts to improve its reliability,^{25,26} the use of the MAS remains controversial because of its questionable validity.^{22,24} Nevertheless, clinicians like to use the MAS because it is easy to use in clinical settings; it does not require any sophisticated equipment or training and is quick to administer.

The results of this study showed that only a small proportion of clinicians (14.0%) are using the Tardieu Scale (TS), either the original or the modified version, even though it has been suggested as a more valid alternative for spasticity assessment.²⁷ Unlike the MAS, the TS takes into consideration the velocity-dependent aspect of the stretch reflex response because it is performed at both slow and fast velocities. However, the reliability of angle measurement in the modified TS is inconsistent.²⁸ The TS also focuses on the perceived resistance to passive movement, which is a consequence of spasticity and may not reflect its neurological origin.

Many researchers have suggested that neurophysiological measures should at least be part of the spasticity evaluation because they provide information about the pathways that are altered in spasticity.^{21,23,29,30} However, these measurements require specialized equipment as well as trained individuals to collect, analyze, and interpret the data. There is still a need to develop spasticity assessments based on neurophysiological measures that are feasible to use in clinical settings.

When questioned about the role of different health care professions in spasticity assessment, all but one respondent indicated that physiotherapists should be responsible for assessing spasticity; this is consistent with the literature.⁹ Most respondents (97.9%) also indicated that more than one professional should evaluate spasticity. It is likely that respondents expect that as many health care professionals as possible should recognize spasticity so that a patient can receive the appropriate interventions within a reasonable period. These results are in line with the idea that spasticity should be assessed and managed by an interdisciplinary or multidisciplinary team.⁸

As with any other outcome measure, spasticity should be assessed at multiple time points during the rehabilitation process to measure the impact of interventions³¹ and modify the treatment plan accordingly. However, the clinical practice guidelines have no clear recommendation with respect to the timing of spasticity assessment for neurological patients. Most of the participants indicated that spasticity should be evaluated on admission, but smaller percentages of participants indicated that it should be evaluated at multiple time points. The lower percentage of clinicians who indicated that spasticity should be assessed at other time points (interim,

discharge, and follow-up) rather than at admission could mean that some clinicians do not expect spasticity to change over time.

The limited capacity of the current clinical measurements to detect changes in spasticity may explain this result.³² It is also possible that clinicians use spasticity assessment as a diagnostic tool rather than as an outcome measure to evaluate the effect of a treatment. Other potential explanations for this result may be related to different barriers to implementing evidence-based neurological practice recommendations, such as lack of time, unavailability of equipment or assessment tools, or shortage of staff.^{33–35}

Surprisingly, 15.5% of respondents believed that spasticity should never be evaluated using a valid and reliable assessment. Because of the wording of the question, it is possible that clinicians were evaluating spasticity at multiple time points but not necessarily using validated outcome measures for spasticity reassessment. This unexpected result may also be related to clinicians' perceptions about which spasticity assessments are valid and reliable. Unfortunately, we are unable to precisely identify the reason for this response rate because of the closed nature of the questions used in the questionnaire. A follow-up step could be to use a mixed-methods design; adding a qualitative phase would enable researchers to explore the rationale behind the answers in greater depth.

Spasticity treatment

Positioning, prolonged muscle stretching, splinting, and motor-level stimulation were indicated as modalities most commonly used by clinicians to manage spasticity. These results are consistent with the *Canadian Best Practice Recommendations for Stroke Care*.¹⁶ Despite the lack of evidence to support the effectiveness of positioning, ROM exercises, stretching, and splinting, these modalities are recommended to treat or prevent spasticity and contractures.¹⁶ In this study, most clinicians indicated that they used a combination of interventions for individuals with spasticity; this is consistent with the literature because of the complexity of the mechanisms underlying spasticity and the variability of the clinical symptoms.^{8,36}

We found no differences in the modalities used for spasticity management among clinicians working with different types of clientele (age group, phase of recovery). A larger proportion of occupational therapists indicated using a single treatment modality, probably reflecting the specific role of some clinicians working in a technical aid service or acting as consultants. We also found differences in the treatment modalities used by physiotherapists and occupational therapists, as well as between clinicians working in public and private clinical settings. Physiotherapists were more inclined than occupational therapists to select muscle stretching and motor-level stimulation, a practice that may reflect the different role of each profession in

spasticity management. Finally, the greater tendency for clinicians in the private sector to use TENS to manage spasticity may reflect a greater emphasis on patient self-management, but our study did not explore the reasons for these choices in depth.

This study had several limitations. First, although it revealed that the majority of clinicians believed it was important to use valid and reliable outcome measures to assess spasticity, these results may not reflect clinicians' overall perception because this group constituted only a proportion of the targeted population. Thus, our results may have overestimated the percentage of clinicians who believed that using outcome measures was important. A social desirability bias may also have occurred despite the use of an anonymous questionnaire.

Second, despite our attempt to contact all physiotherapists and occupational therapists working in Canada in the area of neurology, some associations did not provide enough information for us to distinguish between clinicians who work with neurological populations and those who do not. Thus, the questionnaire was sent to some individuals who were not targeted by this study. These clinicians were not expected to answer the questionnaire, and this can explain the low response rate (5.0%). Therefore, we calculated an adjusted response rate by dividing the number of respondents who completed the questionnaire by the entire targeted population. According to the Canadian Institute for Health Information (CIHI), 1,016 physiotherapists were working in the field of neurology in 2014.³⁷ Unfortunately, this information is not available for Canadian occupational therapists; however, the population of occupational therapists working in Canada in the area of neurology can be estimated using data from the Canadian Association of Occupational Therapists (personal communication)³⁸ and CIHI.³⁹ In 2014, approximately 1,500 occupational therapists were working with neurological populations in Canada, and the adjusted response rate confirmed that 12.7% of the entire population of Canadian physiotherapists and occupational therapists working with neurological clients completed the survey.

A third limitation relates to non-response bias. The sample was representative of the current profile of Canadian physiotherapists and occupational therapists^{37,39} except for the distribution of clinicians across the country. Indeed, more than half of our sample consisted of clinicians from Quebec because of the availability of both physical and occupational therapy membership lists; this was not the case in the other provinces. The Quebec physical and occupational therapy workforce is very similar to the rest of the country in terms of sex, age group, and number of years of experience.^{37,39} Small differences can, however, be observed in the highest level of education and in the location of graduation: A smaller proportion of clinicians working in Quebec obtained an

MSc degree (physiotherapists, 15.9%; occupational therapists, 20.9%) compared with the rest of Canada (physiotherapists, 26.7%; occupational therapists, 33.4%). Almost all Quebec clinicians graduated in Canada (physiotherapists, 96.8%; occupational therapists, 99.2%), whereas this proportion was slightly lower in the rest of Canada (physiotherapists, 83.8%; occupational therapists, 93.1%).

Some limitations were also identified with the questionnaire. When questioned about the assessments that the respondents would typically use to assess spasticity, *functional scales* should have been defined and some examples provided; this terminology seems to have been unclear. Moreover, interpreting the results would have been strengthened by a better description of work environment and patient characteristics. As an example, numerous specialized spasticity clinics across the country provide interdisciplinary, client-centred assessment and treatment of people experiencing muscle spasticity, but the questionnaire did not capture which respondents worked in this type of clinic. It is likely that the answers of clinicians working in specialized spasticity clinics would have differed from those of clinicians working in less specialized settings.

CONCLUSIONS

A large proportion of clinicians believe that using a validated and reliable assessment to evaluate spasticity is important. In their daily practice, clinicians are using a combination of assessments; however, most of these are only indirect methods of measuring spasticity. There is, therefore, a discrepancy between the clinicians' perception of the importance of using a valid spasticity assessment and the actual validity of the measures they use. Future work needs to focus on developing spasticity assessments on the basis of neurophysiological measures that are feasible to use in clinical settings.

KEY MESSAGES

What is already known on this topic

Because of the significant impact of spasticity on activities of daily living, managing spasticity is an important component of neurological rehabilitation. However, there is conflicting evidence about which physical treatment modality is the most effective in reducing spasticity. To properly manage spasticity, a treatment plan must be based on an accurate clinical assessment of the patient. Several clinical practice guidelines have recommended using valid and reliable tools to assess spasticity. However, whether these guidelines have been implemented in clinical practice and what effect this implementation may have on patient care is unknown.

What this study adds

This study is the first to document clinicians' practices in Canada in assessing and treating spasticity. A better understanding of the current trends in physiotherapy

and occupational therapy in Canada will help to tailor strategies to promote the implementation of recommendations from clinical practice guidelines and improve practice.

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