

## When will the evidence catch up with clinical practice?

The impetus for this letter to the Editor of *Physiotherapy Canada* comes from the recently released 2010 update of the Canadian Best Practices Recommendations for Stroke Care.<sup>1</sup> Many of the recommendations made are a welcome addition to our stock of ammunition to advocate for effective stroke care for Canadians. However, we take issue with the recommendations for stroke rehabilitation, and in particular the recommendations for upper- and lower-limb management following stroke,<sup>1(p.109–24)</sup> on three points: first, the use of hierarchies of evidence that privilege a methodology originally designed for drug trials to evaluate complex interventions such as stroke rehabilitation; second, the use of phrases such as “rehabilitation of the upper limb”<sup>1(p.109)</sup> and “rehabilitation of the lower limb”<sup>1(p.109)</sup> in an era of client-centred and humanistic care; and, finally, the lack of understanding of the nature of neurodevelopmental therapy (NDT) / Bobath. We feel strongly that these three issues need to be discussed and debated in the rehabilitation and physical therapy community. We hope that the following comments will be taken in the spirit of debate and will generate discussions that will help to move the dialogue between clinicians and researchers forward to a more collegial exchange, whereby we can ensure that the “evidence” being used to evaluate practice is appropriate.

First, stroke rehabilitation is a complex intervention and, as such, is not amenable to the type of randomized controlled trials (RCT) originally developed to evaluate the effects of a single intervention such as a drug.<sup>2</sup> Given mounting criticism of the use of traditional medical levels of evidence,<sup>3–6</sup> it is disappointing to see these that new Best Practices Recommendations continue to privilege RCTs as the “gold standard.” RCTs are appropriate when “studying the effectiveness of an intervention that is unidimensional, discrete, non-individualized, and controllable through a highly refined protocol”;<sup>5(p.1173)</sup> by no stretch of the imagination does this description apply to stroke rehabilitation. While RCTs are best suited to determine the effectiveness of clearly defined interventions, other types of qualitative and quantitative designs are likely better suited to address complex rehabilitation interventions.<sup>5</sup> Essentially, RCTs are the wrong tool for evaluating stroke rehabilitation—just as a thermometer would be the wrong tool to measure weight.

Numerous scientists and philosophers, even within the bastions of medicine and epidemiology, are questioning hierarchies of evidence that privilege experimental

designs, and particularly RCTs.<sup>7–9</sup> The extensive criticisms of existing hierarchies of evidence and the underlying criteria for “evidence” have been summarized into the following categories: reliance on empiricism, narrow definition of evidence, lack of evidence of efficacy, limited usefulness for individual patients, and threats to the autonomy of the doctor/patient relationship.<sup>10</sup> So why are some rehabilitationists still going along with outmoded hierarchies of evidence, even while numerous others have argued against applying such hierarchies to rehabilitation at all?<sup>3,4,6</sup>

Recommendations based predominantly on published experimental studies are also problematic because of publication bias and funding availability bias.<sup>9</sup> It is very difficult to get research funding to evaluate “conventional” practice (in other words, what therapists have been doing effectively from day to day for many years); research funding must usually be tied to something new, unique, or different. As a result, we end up with evidence for isolated treatments such as functional electrical stimulation (FES) or constraint-induced movement therapy (CIMT) and recommendations that are impairment focused rather than addressing issues of activity and participation. Did we really need multiple RCTs<sup>11–22</sup> to know that CIMT is effective only for clients who already have some active wrist and finger extension? Are there really any therapists out there worth their salt who would constrain the functioning arm of a person who has only minimal movement of the affected arm?

Appropriate therapy for persons with stroke is not simply a compilation of isolated impairment-level interventions. Rather, what is needed is re-education of movement and function for a person in his or her environment, such that the individual can maintain a sitting posture and achieve standing, stepping, walking, and maximal upper-limb function to perform daily activities that allow him or her to fully participate in roles that he or she finds meaningful. In such a situation, a recommendation that “exercise and functional training should be directed towards enhancing motor control for restoring sensorimotor and functional abilities”<sup>1(p.109)</sup> is not remotely helpful to practising clinicians, and a recommendation that “overhead pulleys should not be used”<sup>1(p.115)</sup> assumes a lack of knowledge on the clinician’s part that is, quite frankly, insulting.

This brings us to our second point. It is with horror that we still see language that takes a body-parts-in-isolation approach, including phrases such as “rehabili-

tation of the upper limb”<sup>1(p.109)</sup> and of “the lower limb,”<sup>1(p.109)</sup> in the twenty-first century. Such language goes against everything we know about the importance of the entire body to movement<sup>23</sup> and contravenes all the principles of client-centred care, the importance of which is well recognized and well documented in rehabilitation.<sup>24–26</sup> Further, it perpetuates the old professionally created division of labour between occupational therapists and physical therapists, whereby the person with a stroke is divided into an arm (treated by an occupational therapist) and a leg (treated by a physical therapist). What about the person who owns the arm and the leg? One of the major limitations of hierarchies of evidence is that patient values and perspectives are omitted<sup>7</sup> or are given short shrift. This approach is so far from what actually occurs in clinical practice as to be unrecognizable to clinicians.

Finally, we take exception to the oft-repeated phrase “There is insufficient evidence to recommend for or against neurodevelopmental therapy (NDT) in comparison to other treatment approaches for motor retraining following acute stroke.”<sup>1(p.118,110)</sup> Reading the recommendation and the supporting evidence carefully, we find that what is actually being said is that we have no evidence that any treatment approach is any better than any other—including evidence-based practice (EBP). Just as there is no “evidence” (using the definition of evidence in hierarchies of evidence) to support NDT/Bobath over any other treatment approach, to date there are no RCTs that demonstrate that health professionals who use EBP provide better health care than those who do not.<sup>9</sup> To quote Cohen et al.,<sup>10(p.40)</sup> “EBM [evidence-based medicine] ... is an interesting, but unproven theoretical approach to the study of medicine.” Sound familiar? If one applies the same criteria of evidence to EBP as to NDT/Bobath, one would reach the conclusion that proponents of EBP are guilty of exactly the same sins of which they accuse proponents of NDT/Bobath—unswerving devotion to an approach that is supported by little empirical evidence.

This is not our argument, however. Rather, we are making the point that EBP and NDT/Bobath are both problem-solving approaches to clinical decision making and, as such, are not amenable to evaluation through narrow experimental designs. To quote Davisch and Murray,<sup>27(p.951)</sup> “it is not simply that no RCTs (of EBM) are *likely* to be carried out ... but such studies could *never* be carried out.” We contend that the same argument applies to NDT/Bobath. NDT/Bobath is a problem-solving approach to the assessment and treatment of individuals following a lesion of the central nervous system<sup>28–30</sup> that focuses on the level of activity rather than on impairment alone. It provides an overall conceptual framework within which clinicians can develop an individualized intervention plan addressing the complex movement challenges faced by someone following

stroke. It is not a series of treatment techniques per se but a reflective, response-based, client-centred treatment approach undergirded by critical movement analysis of the interrelationship of posture and movement in the context of activities and participation.

“Aha!” some will say. “Since when has NDT/Bobath been a problem-solving approach to clinical decision making? What about those treatment techniques I remember, such as reflex-inhibiting postures and developmental sequences?” Well, just as EBP has evolved since its early days, so has the NDT/Bobath approach. We refer the interested reader to recent publications that describe the NDT/Bobath concept in contemporary clinical practice.<sup>28–33</sup> Some may challenge, “If the current NDT/Bobath approach has evolved so much, why don’t we call it something else?” Well, physical therapy practice in 2011 is very different from what it was in 1930, but we still call it physical therapy. Even EBP has evolved in response to reflection and criticism since it was first proposed in the 1990s,<sup>34</sup> but proponents still cling to the term “evidence-based.”

So why does NDT/Bobath remain so popular among clinicians, despite the apparent evidence that it is no better (nor worse—“a lack of evidence of effectiveness is not the same as evidence of lack of effectiveness”<sup>9(p.102)</sup>) than any other approach? Why are therapists so devoted to NDT/Bobath? Because it helps therapists think through the complexity of movement problems in people with disordered movement and gives them the skills they need to optimize the client’s potential. Anyone who has ever faced the daunting task of helping a person following stroke to relearn even the most basic movements knows that a series of individual, isolated “treatments” is not going to carry the day. That is why therapists welcome approaches, such as NDT/Bobath, that provide conceptual, problem-solving frameworks that we can use to visualize and problem-solve our way through the complex, multistage process of recovery from stroke. NDT/Bobath provides a holistic, humanistic framework that allows clinicians to see when and how to incorporate treatment techniques such as FES, CIMT, and so on.

Are NDT/Bobath and the use of research evidence incompatible? Of course not—although, in keeping with others, we prefer the phrase “evidence-informed practice.”<sup>9</sup> Recommendations for best practice should “enhance clinical judgement, not replace or stifle it.”<sup>8(p.879)</sup> In fact, we contend that many of the 2010 Best Practice Recommendations for Stroke<sup>1</sup> support components of the NDT/Bobath approach. The use of functional activities and training of the affected side is a core tenet of NDT/Bobath, first put forward by Berta Bobath at a time when other clinicians simply taught compensatory strategies with the unaffected side.<sup>31</sup> Bobath was, if not the first, one of the first to argue that therapists should focus on facilitating recovery of motor function on the affected side. The recommendation that “the shoulder

should not be passively moved beyond 90 degrees of flexion and abduction unless the scapula is upwardly rotated and the humerus is laterally rotated"<sup>1(p.115)</sup> points out the need to ensure scapular mobility when working on shoulder elevation and reflects another basic tenet of NDT/Bobath—the need for optimal alignment to integrate postural control and task performance.<sup>31</sup>

A key tenet of NDT/Bobath that is unfortunately missing from the Canadian Best Practices for Stroke Recommendations,<sup>1</sup> underscoring our dismay over the use of the terms “upper limb” and “lower limb,” is the importance of the core in movement control. There is actually experimental evidence to support this premise that provides an interesting example of the challenges facing therapists in clinical practice. In a study published in 2006, Michaelsen et al.<sup>35</sup> examined whether task-specific training with trunk restraint produces greater improvement in arm impairment and function than training without trunk restraint in patients with chronic hemiparesis. They concluded that treatment should be tailored to the severity of arm impairment, with particular attention to controlling excessive trunk movement if the goal is to improve arm movement quality and function. The clinician is left with several questions: *How do I actually control excessive trunk movement? Should I be restraining all my clients to their chairs while they do arm activities? Wouldn't it make more sense to train my clients in activities that focus on trunk stability along with task-specific training of upper extremity activities? How would I actually do that?* They turn to NDT/Bobath because it offers them conceptual tools and strategies to help the client improve trunk control and “prevent excessive trunk movements” as part of a holistic approach to movement and function re-education.

We anticipate that the response to this editorial will be the usual criticisms—we are clinging to an unproven approach, EBP acknowledges other evidence than just RCTs, and we are privileging clinical expertise over “science.” The discourse around EBP has become so widespread and familiar that it is heretical even to suggest that we should not base our treatments on evidence—but, in fact, that is not what we are arguing. We contend, rather, that the definitions of evidence to which the profession currently binds itself are inherently flawed. We need to take ownership of how we define the evidence by which we will be judged, and not subscribe unquestioningly to an increasingly criticized and outmoded, medically driven definition of evidence. We need to move beyond claiming the moral high ground by proclaiming that one approach is better than another—and, yes, we agree that proponents of both EBP and NDT/Bobath are equally guilty of this charge. Instead, we need to start listening to each other—researchers, clinicians, persons with stroke and their families—so as to understand what it is that each of us values and how to find

a middle ground wherein our practice is evidence informed, clinically relevant, and client centred. Only then will the evidence catch up with the practice and truly reflect what rehabilitation contributes to the health and well-being of persons with stroke.

*Cheryl A. Cott, BPT, MSc, PhD*  
Professor, Department of Physical Therapy,  
University of Toronto

*Julie Vaughan Graham, Dip. PT, MSc*  
Lecturer, Department of Physical Therapy,  
University of Toronto

*Karen Brunton, BScPT*  
Lecturer, Department of Physical Therapy,  
University of Toronto

## REFERENCES

1. Canadian Stroke Strategy. Canadian Best Practice Recommendations for Stroke Care Update 2010. Canadian Stroke Strategy; 2010 [cited 2011 May 6]. Available from: [http://www.strokebestpractices.ca/wp-content/uploads/2010/12/2010\\_BP\\_ENG.pdf](http://www.strokebestpractices.ca/wp-content/uploads/2010/12/2010_BP_ENG.pdf).
2. Campbell M, Fitzpatrick R, Haines A, et al. Framework for design and evaluation of complex interventions to improve health. *BMJ*. 2000;321(7262):694–6. doi:10.1136/bmj.321.7262.694. Medline:10987780
3. Hyde P. Fool's gold: examining the use of gold standards in the production of research evidence. *Brit J Occup Ther*. 2004;67:89–94.
4. Tickle-Degnen L, Bedell G. Heterarchy and hierarchy: a critical appraisal of the “levels of evidence” as a tool for clinical decision making. *Am J Occup Ther*. 2003;57(2):234–7. doi:10.5014/ajot.57.2.234. Medline:12674318
5. Bartlett DJ, Macnab J, Macarthur C, et al. Advancing rehabilitation research: an interactionist perspective to guide question and design. *Disabil Rehabil*. 2006;28(19):1169–76. doi:10.1080/09638280600551567. Medline:17005478
6. Wiseman-Hakes C, MacDonald S, Keightley M. Perspectives on evidence based practice in ABI rehabilitation. “Relevant research”: who decides? *NeuroRehabilitation*. 2010;26(4):355–68. Medline:20555159
7. Upshur REG. Looking for rules in a world of exceptions: reflections on evidence-based practice. *Perspect Biol Med*. 2005;48:477–89. Medline:16227661. doi:10.1353/pbm.2005.0098
8. Battista RN, Hodge MJ, Vineis P. Medicine, practice and guidelines: the uneasy juncture of science and art. *J Clin Epidemiol*. 1995;48(7):875–80. doi:10.1016/0895-4356(94)00199-Z. Medline:7782795
9. Jadad AR, Enkin MW. *Randomized control trials: questions, answers and musings*. 2nd ed. Boston: BMJ Books / Blackwell; 2007.
10. Cohen AM, Stavri PZ, Hersh WR. A categorization and analysis of the criticisms of Evidence-Based Medicine. *Int J Med Inform*. 2004;73(1):35–43. doi:10.1016/j.ijmedinf.2003.11.002. Medline:15036077
11. Dromerick AW, Lang CE, Birkenmeier RL, et al. Very early constraint-induced movement during stroke rehabilitation (VECTORS): a single-center RCT. *Neurology*. 2009;73(3):195–201. doi:10.1212/WNL.0b013e3181ab2b27. Medline:19458319
12. Sawaki L, Butler AJ, Leng X, et al. Constraint-induced movement therapy results in increased motor map area in subjects 3 to 9

- months after stroke. *Neurorehab Neural Re.* 2008;22(5):505–13. doi:10.1177/1545968308317531. Medline:18780885
13. Boake C, Noser EA, Ro T, et al. Constraint-induced movement therapy during early stroke rehabilitation. *Neurorehab Neural Re.* 2007;21(1):14–24. doi:10.1177/1545968306291858. Medline:17172550
  14. Dromerick AW, Edwards DF, Hahn M. Does the application of constraint-induced movement therapy during acute rehabilitation reduce arm impairment after ischemic stroke? *Stroke.* 2000;31(12):2984–8. Medline:11108760
  15. Page SJ, Sisto SA, Levine P. Modified constraint-induced therapy in chronic stroke. *Am J Phys Med Rehabil.* 2002;81(11):870–5. doi:10.1097/00002060-200211000-00013. Medline:12394999
  16. Myint MW, Yuen FC, Yu KK, et al. Use of constraint-induced movement therapy in Chinese stroke patients during the sub-acute period. *Hong Kong Med J.* 2008;14(5 Suppl):40–2. Medline:18941274
  17. Brogårdh C, Vestling M, Sjölund BH. Shortened constraint-induced movement therapy in subacute stroke - no effect of using a restraint: a randomized controlled study with independent observers. *J Rehabil Med.* 2009;41(4):231–6. doi:10.2340/16501977-0312. Medline:19247541
  18. Page SJ, Sisto S, Levine P, et al. Efficacy of modified constraint-induced movement therapy in chronic stroke: a single-blinded randomized controlled trial. *Arch Phys Med Rehabil.* 2004;85(1):14–8. doi:10.1016/S0003-9993(03)00481-7. Medline:14970962
  19. Lin K-C, Wu C-Y, Wei T-H, et al. Effects of modified constraint-induced movement therapy on reach-to-grasp movements and functional performance after chronic stroke: a randomized controlled study. *Clin Rehabil.* 2007;21(12):1075–86. doi:10.1177/0269215507079843. Medline:18042603
  20. Page SJ, Levine P, Leonard A, et al. Modified constraint-induced therapy in chronic stroke: results of a single-blinded randomized controlled trial. *Phys Ther.* 2008;88(3):333–40. doi:10.2522/ptj.20060029. Medline:18174447
  21. Lin K-C, Wu C-Y, Liu J-S. A randomized control trial of constraint-induced movement therapy after stroke. *Acta Neur S.* 2008;101:61–4.
  22. Lin K-C, Chang YF, Wu C-Y, et al. Effects of constraint-induced therapy versus bilateral arm training on motor performance, daily functions, and quality of life in stroke survivors. *Neurorehab Neural Re.* 2009;23(5):441–8. doi:10.1177/1545968308328719. Medline:19118130
  23. Fisher B. Effect of trunk control and alignment on limb function. *J Head Trauma Rehabil.* 1987;2(2):72–9. doi:10.1097/00001199-198706000-00011.
  24. Law M, Baptiste S, Mills J. Client-centred practice: what does it mean and does it make a difference? *Can J Occup Ther.* 1995;62(5):250–7. Medline:10152881
  25. Sumsion T, Smyth G. Barriers to client-centredness and their resolution. *Can J Occup Ther.* 2000;67(1):15–21. Medline:10695165
  26. Cott CA. Client-centred rehabilitation: client perspectives. *Disabil Rehabil.* 2004;26(24):1411–22. doi:10.1080/0963828040000237. Medline:15764361
  27. Devisch I, Murray SJ. 'We hold these truths to be self-evident': deconstructing 'evidence-based' medical practice. *J Eval Clin Pract.* 2009;15(6):950–4. doi:10.1111/j.1365-2753.2009.01232.x. Medline:20367689
  28. Howle J. Neuro-developmental treatment approach: theoretical foundations and principles of clinical practice. Laguna Beach (CA): NDTA; 2002.
  29. Raine S. Defining the Bobath concept using the Delphi technique. *Physiother Res Int.* 2006;11(1):4–13. doi:10.1002/pri.35. Medline:16594311
  30. Raine S. The current theoretical assumptions of the Bobath concept as determined by the members of BBTA. *Physiother Theory Pract.* 2007;23(3):137–52. doi:10.1080/09593980701209154. Medline:17558878
  31. Graham JV, Eustace C, Brock K, et al. The Bobath concept in contemporary clinical practice. *Top Stroke Rehabil.* 2009;16(1):57–68. doi:10.1310/tsr1601-57. Medline:19443348
  32. Gjelsvik BEB. *The Bobath concept in adult neurology.* New York: Thieme; 2008.
  33. Gjelsvik BEB. *Bobath concept: theory and clinical practice in neurological rehabilitation.* Oxford: Wiley-Blackwell; 2009.
  34. Buetow S, Upshur R, Miles A, Loughlin M. (). Taking stock of evidence-based medicine: opportunities for its continuing evolution. *J Eval Clin Pract.* 2006;12:399–404.
  35. Michaelsen SM, Dannenbaum R, Levin MF. Task-specific training with trunk restraint on arm recovery in stroke: randomized control trial. *Stroke.* 2006;37(1):186–92. doi:10.1161/01.STR.0000196940.20446.c9. Medline:16339469