Towards evidenced-based practice – A systematic review of methods and tests used in the clinical assessment of hypotonia

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ABSTRACT

Background: *There is much contention about the measures used for the assessment of hypotonia in children and in order to determine what is available within the scientific literature, a systematic review to provide a critical appraisal of the studies describing the methods and tests used in the clinical assessment of hypotonia in children was undertaken.* **Methods:** *A systematic process in searching and identifying relevant literature was followed. An analysis and synthesis of the literature was undertaken by two reviewers, with a specific review question, search strategy and inclusion criteria.* **Results:** *A hierarchy of the levels of evidence is reported in this paper. Twelve studies met the inclusion criteria, and were evaluated according to the critical review form for quantitative studies developed at McMaster University Occupational Therapy Evidence-Based Practice Research Group. A quality score was also provided in addition to the important characteristics of the included studies.* **Conclusions and implications of key findings:** *There appeared to be a paucity of scientific literature that documented the objective assessment of hypotonia in children. This review has thus identified the need for more studies with greater methodological rigour in order to determine best practice with respect to the methods used in the assessment of low muscle tone in the paediatric population.*

Key words: clinical assessment; hypotonia, low muscle tone, systematic review

BACKGROUND

A key competency in providing health care in any setting is the appraisal of relevant research and the application of evidence into practice. Evidence based practice (EBP) has gained momentum over the last decade. Prior to its introduction, clinicians tended to base their decisions on professional expertise and client information with little attention being given to what the literature, specifically the research literature, reported[1]. It thus seems imperative that the evidence from the literature be located, appraised and interpreted in order to assist the clinician to apply the evidence to practice. Additionally, clinicians are challenged to apply evidence from the scientific literature to help them determine, not only the appropriateness of selected methods and choices in client assessment, but also appropriate methods of for the management of the client. Drawing on research as a component of decision making, reduces bias and empowers both the clinician and client in making informed decisions based on strong evidence thereby ensuring good practice[2].

The assessment of hypotonia has been a contentious issue over the last few decades. Anecdotal evidence suggests that children have been "labeled" with the diagnosis of hypotonia, without there being objective evidence to support the findings. The author has experienced this in clinical practice. A search of the scientific literature reflected a paucity of research to guide the assessment of hypotonia in children. A systematic review thus seemed a logical step not only to locate all relevant literature to guide practice in this area, but also to identify possible gaps to inform future research.

OBJECTIVES

The objective of this study was to identify and appraise existing assessments reported in the literature that could be used by clinicians (occupational therapists, physiotherapists and paediatricians) to detect hypotonicity in children and to the identify any gaps that would inform future research into the assessment of hypotonia in children.

METHODS

Design: This study followed the design of a systematic review, without meta-analysis. The author developed a systematic review protocol which was peer-reviewed by a colleague trained in systematic reviews, prior to the data collection phase.

Instruments/Tools used in this Systematic Review

1. **The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement**[3] was used to help the author to ensure transparent and complete reporting of the findings of the systematic review. The PRISMA Statement is an evidenced-based minimum set of items for reporting systematic reviews. It consists of a 27-item checklist and a four-phase flow diagram, illustrating the flow of information through the different phases of a systematic review. The checklist and flow diagram were both used in reporting the findings in this review.
2. The **Oxford Centre for Evidence-based Medicine (OCEBM) Levels of Evidence**[4] (2009 version): This hierarchy was used as a first step to classify the research articles into categories based on the strength of the design for answering the review question (refer to *Table 1*). The 2009 version of the tool[4] was utilised over the 2011 version[5] due to its more descriptive presentation (i.e. a total of 5 sub-categories, within the description of the 5

Table 1: Hierarchy of Evidence

LEVEL	TYPE OF STUDIES
Level 1a	Systematic Review (with **homogeneity**[1]) of Level 1 diagnostic studies Systematic Review (with **homogeneity**[1]) of prospective cohort studies
Level 1b	**Validating**[2] cohort study with good **reference standards**[3] Prospective cohort study with good follow-up
Level 1c	Absolute **SpPins and SnNouts**[4]
Level 2a	SR (with homogeneity) of retrospective cohort studies or untreated control groups in RCTs; SR (with homogeneity) of 2b and better studies
Level 2b	Exploratory cohort study with good **reference standards**[3] Retrospective cohort study, or poor follow-up
Level 2c	Ecological studies
Level 3a	SR (with homogeneity) of 3b and better studies
Level 3b	Non-consecutive study; or without consistently applied **reference standards**[3] Non-consecutive cohort study, or very limited population
Level 4	Case-control study, poor or non-independent **reference standard**[3] Case-series or superseded **reference standards**[3]
Level 5	Expert opinion without explicit critical appraisal, or based on physiology or bench research

levels). Whilst the levels of evidence approach to evaluation is attractive in part because of its apparent simplicity, more careful reading around levels of evidence shows that determining the appropriate level of evidence represented by a given research study requires both an assessment of the quality of the work as well as the research design[6,7,8]. Hence a critical appraisal tool was also utilized.

3. The **Critical Review Form for Quantitative Studies** developed by the McMaster University Occupational Therapy Evidence-Based Practice Research Group[9] was used to assess the methodological quality of each of the studies. It comprises ten questions related to the methodological quality of each study, related to the following components, viz. study purpose, literature and justification, design, sampling, outcomes, intervention, results, conclusions and implications. The reviewer commits to a yes/no response for each of the questions related to these components.
4. **Assessment of Multiple Systematic Reviews (AMSTAR)[10] Tool:** This tool was developed to assess the methodological quality of a systematic review. It consists of 11 items and has good face and content validity for measuring the methodological quality of systematic reviews[10]. The author uses this tool at the end of this paper in an attempt to describe the strengths and limitations of this review.

Criteria for considering studies for this review

Types of studies: All studies that described the process, methods, and tests/assessments used to detect/diagnose low muscle tone (hypotonia) were included as the clinical assessment of low muscle tone is not diagnosis- dependent. All studies that were classified between levels 1-4 on the OCEBM Levels of evidence[4] will be considered for the critical appraisal. Level 5 was excluded as these included studies that were expert opinion and not based on empirical research. Studies describing or determining the effectiveness of therapy or intervention strategies for treating hypotonia were excluded.

Types of participants: Studies that included children (0-12 years) who presented with low muscle tone were included, irrespective of the underlying diagnosis. Studies had to include clinicians within the disciplines of occupational therapy, physiotherapy (physical therapy) and paediatrics (paediatricians and paediatric neurologists).

Types of Intervention: Studies in which methods and/or tests were used in the assessment and diagnosis of low muscle tone in the paediatric population by clinicians as well as the most valid clinical criteria or characteristics that were used in the diagnosis of low muscle tone in the paediatric population were included.

Search methods for identifying studies: The following electronic databases were searched from their inception until January 2013: MEDLINE, CINAHL, ERIC, ScienceDirect, Google Scholar, Physiotherapy Evidence Database (PEDro), Health Source: Nursing and Academic Edition and Academic Search Complete (EBSCo). The following limits were set: articles had to be full text and in English. The following search **strings** were utilised: *(defin* OR assess* OR test OR evaluat*)* and *(hypotonia OR low muscle tone)* and *(children)*.

Data collection process: Each study was assessed and rated independently by two reviewers, one of which was the author (primary reviewer), and a secondary reviewer, for their quality and suitability. Titles and abstracts were screened independently by each reviewer and those that were not relevant were removed. The full text of the remaining articles, were then examined and the inclusion criteria used to identify relevant articles.

Synthesis of results: Studies were individually rated by each reviewer, with the following process:

1) *Classifying the strength of the study designs:* Studies were categorised based on the strength of the design according to the OCEBM levels of evidence[4] (refer to *Table 1*).
2) *Determining the quality of the individual studies[6]:* Each reviewer then reviewed the ten criteria outlined in the Critical Review Form for Quantitative Studies[9] for assessing the methodological quality of the studies, with yes/no responses. For every yes response a score of one was allocated and a percentage calculated at the end of scoring. This is in keeping with other studies that used appraisal tools to determine a quality score[11]. The grading of the quality assessment checklist score is described as follows; 0-40% (poor); 40%-70% (satisfactory) and 70-100% (good) (refer to *Table 2*).

Table 2: Quality Score of Appraised Studies

AUTHOR AND YEAR	TYPE OF STUDY	QUALITY %	RATING
Birdi et al, 2005[16]	Retrospective Cohort	70%	Good
Carboni et al, 2002[21]	Retrospective Cohort	60%	Satisfactory
Cetin et al, 2009[27]	Non-consecutive	70%	Good
Laugel et al, 2008[17]	Retrospective Cohort	80%	Good
Leyenaar et al, 2005[26]	Single Case	70%	Good
Martin et al, 2005[24]	Cross-sectional	80%	Good
Martin et al, 2007[23]	Cross-sectional	80%	Good
Pilon et al, 2000[22]	Retrospective Cohort	70%	Good
Paine, 1963[18]	Retrospective Cohort	60%	Satisfactory
Paro-Panjan and Neubauer, 2004[19]	Retrospective Cohort	70%	Good
Richter et al, 2001[20]	Retrospective Cohort	80%	Good
Van der Meche' and van Gijn, 1986[25]	Case Control	70%	Good

3) *Identification of important characteristics of individual studies[6]:* Each reviewer extracted characteristics of the included articles, which outlined the year of the study, study design, participants/ subjects, intervention and outcomes of the studies. These are described in *Table 3* on pages 4 and 5.

The reviewers then collated their findings. Disagreements were discussed until consensus was reached.

RESULTS

A total of 592 citations were initially identified (*Figure 1 on page 6*). After removing duplicates, there were 586 potentially relevant articles. An additional 125 articles were excluded from the title and abstract due to the fact that these studies focussed on intervention for children with hypotonia[12,13], developmental outcomes for infants with hypotonia[14] and assessment of the spectrum of muscle tone.[15] Of the remaining 461 articles only 27 articles fulfilled the inclusion criteria, as outlined above. Of these 27 articles, 15 were classified as Level 5 on the OCEBM levels of evidence, based on reading of the full text article, and were excluded from the critical appraisal process, as these articles were based on expert opinion. The remaining 12 articles were exposed to the critical appraisal process. Full texts of these articles [16-27] were re-read by the reviewers, to determine once more if the studies met the inclusion criteria. Discrepancies were discussed until consensus was reached.

Quality score and important characteristics of included studies: Following extraction, each included article was appraised and a quality score calculated. These quality scores based on the *critical review form for quantitative studies*[9] is described in *Table 2*. Ten out of the 12 included studies achieved a good rating. Additionally, the important characteristics of the included studies as suggested by Domholdt[6], were extracted (refer to *Table 3*). No *systematic reviews* were identified. Five *retrospective cohort studies*[14-18], two *longitudinal studies*[19,20], two *exploratory studies*[21,22], one *case control study*[23], one *case study*[24] and one *non–consecutive* cohort study[25] were accessed.

Table 3: Characteristics of the Studies appraised

Source	Level of evidence	Study Setting Country	Subjects/ Participants	Design	Intervention	Outcome
Birdi et al[16]	Retrospective Cohort Study (2b)	**Winnipeg, Canada**	89 records of infants at a Tertiary Care Children's Hospital	Retrospective Chart Audit	To determine the value of diagnostic investigations in infants presenting with generalised hypotonia	Authors suggest that a systematic evaluation of a floppy infant be followed by careful selection of investigations. A definitive diagnosis was established in 60 infants, and of the 60, 40% of the cases were diagnosed purely on clinical grounds
Carboni et al[21]	Longitudinal Study (2b)	**Rome, Italy**	41 children (9 months to 12 yrs) and 39 kindreds	(1985-2000)	Joint hyperlaxity with needle muscle biopsies	Studied the correlation between congenital hypotonia with favorable outcome and joint hyperlaxity with needle muscle biopsies and found a correlation between hypotonia and joint hyperlaxity
Cetin et al[27]	Non-consecutive Cohort study/ very limited population (3b)	**Lille, France**	37 children aged between 0 and 24 months	Retrospective Single-centre study (1994-2006)	Assessed the sensitivity of ENMG in the aetiological diagnosis of hypotonia of neuromuscular origin	In infants presenting with hypotonia, ENMG is useful in the diagnosis of peripheral neuropathy
Laugel et al[17]	Retrospective Cohort Study (2b)	**Strasbourg Cedex, France**	144 Neonates	Retrospective Study	Assessed reliability of the first physical examination as well as the contribution of standard diagnostic tests (e.g. neuroimaging, metabolic screening, EMG and nerve conduction studies) in diagnosing hypotonia	A final diagnosis was reached in 120 cases. Combination of diagnostic algorithms & tests are proposed. The results indicated that the initial physical examination, could correctly identify the type of hypotonia in eight out of ten eventually elucidated cases In the group of central type hypotonia, neuroimaging & EEG is to be used as 1st line tests. In peripheral type hypotonia, DNA based tests are to be performed as 1st line tests. Muscle biopsy, NCS & EMG should be 2nd line tests. For undetermined cases, a longer follow up which may reveal specific clinical signs is recommended
Leyenaar et al[26]	Single Case Study (4)	**Halifax, Nova Scotia**	A five- month old infant referred to the IWK health centre	Case Study	To present a rational, simple & accurate diagnostic approach to hypotonia in infancy	A careful history and physical examination is said to provide most of the clues to a diagnosis of hypotonia
Martin et al[24]	Exploratory Study (2b)	**Indianapolis, USA**	86 Occupational and Physical Therapists	Exploratory Study	Purpose was to identify characteristics of children with hypotonia to begin the process of operationally defining hypotonia	Children with hypotonia have decreased strength, activity tolerance, delayed motor skills, rounded shoulder posture, leaning onto supports, hypermobile joints, increased flexibility & poor attention & motivation
Martin et al[23]	Exploratory Study (2b)	**Indianapolis, USA**	268 Occupational and Physical Therapists	Exploratory Study	Purpose was to further develop and begin to confirm the previous studies findings identifying 8 clinical characteristics of hypotonia	Despite agreement amongst physical and occupational therapists on characteristics of hypotonia and potential for improvement, clear clinical guidelines for the diagnosis and quantification of hypotonia have yet to be determined

EMG= electromyography; NCS = Nerve conduction studies; ENMG= electroneuromyography; NICU = Neonatal Intensive Care Unit

.....continued on page 5

Table 3: Characteristics of the Studies appraised .... continued from page 4

Source	Level of evidence	Study Setting Country	Subjects/ Participants	Design	Intervention	Outcome
Pilon et al[22]	Longitudinal Study (2b)	**Ontario, Canada**	141 infants	Longitudinal Study	To determine relationship between hypotonia and joint laxity to early motor development	The study did not detect a relationship between hypotonia or joint laxity to motor development. Results support the perspective that hypotonia is not causally implicated in motor delays
Paine[18]	Retrospective Cohort Study (2b)	**Washington DC, USA**	112 follow up studies of a 133 patients (6 months to 2½ years)	Retrospective Cohort Study	To review children who are referred because of slow motor development, the hypotonia being recognised by the physician on examination *(Intervention poorly described in the article)*	Concluded that diagnosis is one of exclusion. Suggested that diagnostic category of congenital hypotonia probably consists of 3 groups: 1. Patients with family histories of double-jointedness, hypotonia or delay in learning to walk, without neurological abnormalities and whose prognosis is benign, apart from delayed motor milestones 2. Patients initially similar to (1) but without positive family histories. 3. Patients with overt or borderline neurological deficits.
Paro-Panjan and Neubauer[19]	Retrospective Cohort Study (2b)	**Ljubljana, Slovenia**	138 hypotonic newborns records	Retrospective Study (10 year period)	Investigated the contribution of clinical data and investigations to the final diagnosis of hypotonia	Good medical history, proper clinical observation and neurologic examination and use of dysmorphology databases assisted in diagnosis of majority of cases. Selective use of neuro-imaging, genetic, biochemical, neurophysiologic, molecular testing and muscle biopsy also contributed.
Richter et al[20]	Retrospective Cohort Study (2b)	**Quebec, Canada**	50 records of neonates admitted to the Neonatal ICU at the Montreal Children's Hospital	Retrospective Cohort Study	To determine the diagnostic profile of neonates admitted to NICU and evaluation of the utility of clinical markers	A stepwise approach to the evaluation of a neonate with hypotonia was suggested based on findings. Careful clinical observation is critical to the proper evaluation of these children. The selective use of molecular and genetic tests based on the clinical evaluation is suggested as being more time and cost efficient.
Van der Meche' and van Gijn[25]	Case Control Study (4)	**Rotterdam, The Netherlands**	36 normal individuals (Control) 18 hypotonic individuals (between 16-81 yrs)	Case Control Study	Investigated if there was any EMG activity during passive stretch, if activity was present, they aimed to determine if this was reflex activity and whether it contributed to resistance felt and lastly if voluntary activity contributed to resistance	72 control legs; 35 hypotonic legs were assessed. Authors found that long-latency stretch reflexes play no role in the clinical assessment of "normal tone" and that passive movements during the clinical examination are of great value, but only to detect spasticity or rigidity.

EMG= electromyography; NCS = Nerve conduction studies; ENMG= electroneuromyography; NICU = Neonatal Intensive Care Unit

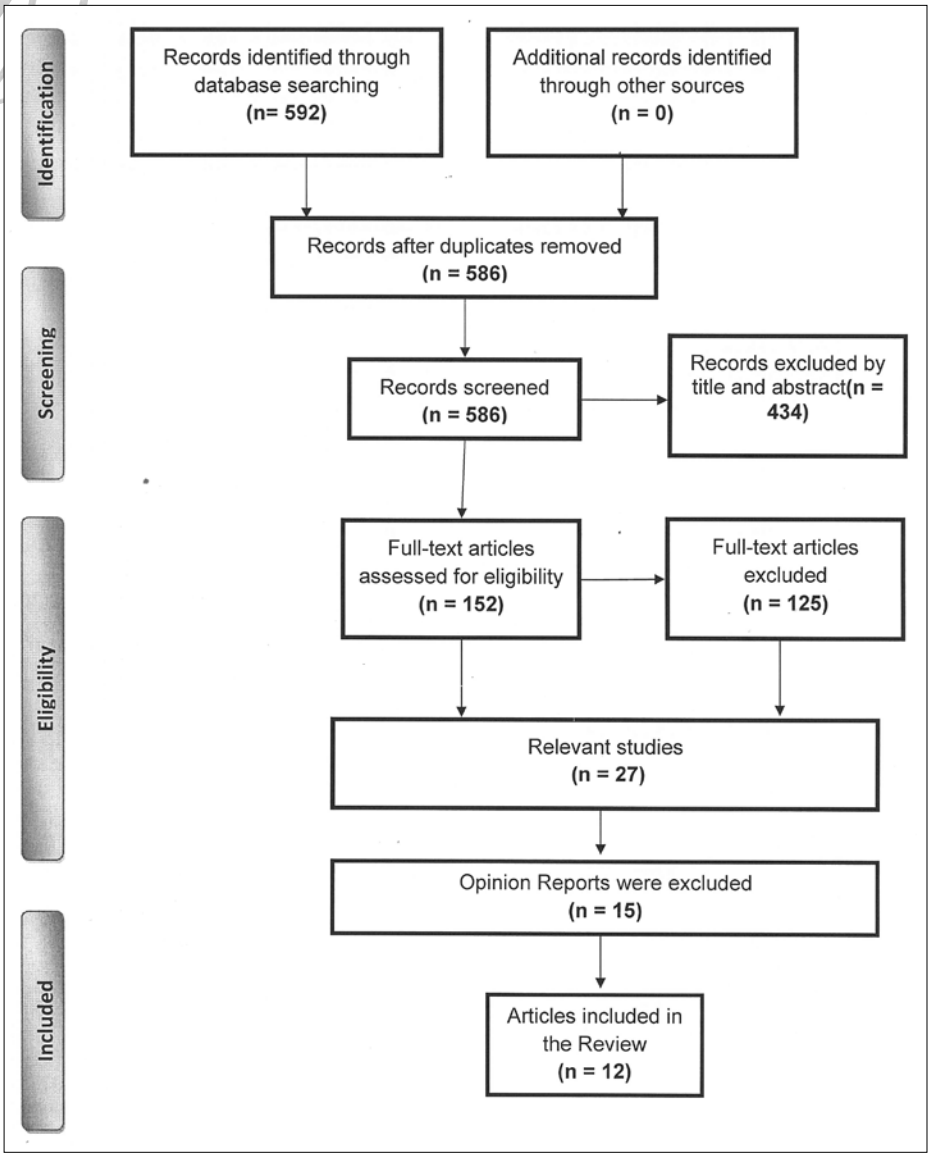

Figure 1: Study Selection

DISCUSSION

With respect to the clinical examination and tests and methods used in the assessment of low muscle tone, in four of the retrospective studies[16,17,19,20], authors aimed at assessing the reliability of the first physical examination and the contribution of different procedures in the assessment process used to diagnose hypotonia. Findings indicated that a good medical history and proper clinical observation including, a neurologic examination, enabled health practitioners to detect hypotonicity in the majority of children. Clinical observation was found to be critical to the accurate evaluation of these children. They further added that the selective use of specific molecular and genetic tests that is based on the initial clinical evaluation, is likely to be more time and cost effective. With respect to clinical characteristics, Carboni et al[21], identified a positive correlation between hypotonia and joint laxity, whilst Martin et al[23,24], gained consensus amongst paediatric therapists on the clinical characteristics such as decreased strength, decreased activity tolerance, delayed motor skills development, rounded shoulder posture, leaning onto supports, hypermobile joints, increased flexibility and poor attention and motivation which contributed towards a diagnosis of hypotonia. No statistically significant or clinically meaningful relationships between hypotonia and motor development were found in the study by Pilon et al[22]. Leyenaar et al[26], used a case study of a 5-month old child to describe an approach to diagnosis of hypotonia in infancy. Authors of a paper on hypotonia and reflexes[25], based their judgements on a case control study in which they determined that that long-latency stretch reflexes play no role in the clinical assessment of "normal tone" and that passive movements during the clinical examination are of great value, but only to detect spasticity or rigidity. Whilst a number of opinion papers have highlighted the importance of the physical or clinical examination in the evaluation of hypotonia[32,40-42],only a few research studies, most of which were retrospective, were found to provide scientific evidence that supported this[16,17,19,20].

In summary, the following were highlighted from this review as being useful in the assessment of hypotonia in children; a good medical history and proper initial clinical observation, a neurologic examination, decreased strength, decreased activity tolerance, delayed motor skills development, rounded shoulder posture, leaning onto supports, hypermobile joints, increased flexibility and poor attention and motivation. Albeit limited, these indicators have contributed to describing the value of clinical assessment in the diagnosis of hypotonia as well as related characteristics.

STRENGTHS AND LIMITATIONS OF THE REVIEW

The author used the AMSTAR tool[10] in an attempt to critically appraise and identify the strengths and limitations of this systematic review.

The strengths of this review can be summarized as follows:

- An a priori design was developed and peer reviewed prior to the initiation of the study
- The author followed a clearly defined process for searching and identification of relevant articles
- There were duplicate study selection and data extraction. Two independent reviewers were involved in the rating of the studies
- A consensus procedure for disagreements was in place
- The types of participants and interventions were clearly defined
- The data collection process and methods had been systematically indicated
- The studies were critically appraised with a quality score being allocated
- Pertinent information was extracted and tabulated (characteristics of included studies) in an attempt to further describe the appraised studies

A limitation within this review was that the review question was specifically targeted at assessment methods, tests and clinical characteristics that are used to detect hypotonia. However, given that the words "methods" and "tests" were used without clarity on this being **clinical** "tests" and "methods", the search revealed studies that utilised neuro-imaging, genetics, metabolic screening tests etc. This may also be an indication of the paucity of literature and lack of scientific evidence on assessments with high sensitivity and specificity, or limitations in the search strategy. Notwithstanding this, these tests and methods should have perhaps been included as part of the exclusion criteria for this review. Given that there were no RCT's available, a meta-analysis was not conducted, but the identified studies were still exposed to a critical appraisal as described in this review.

AUTHOR'S CONCLUSIONS

This systematic review aimed to determine the methods, tests and clinical criteria that are used in the assessment and diagnosis of

hypotonia in the paediatric population by occupational therapists, physiotherapists, paediatricians and paediatric neurologists. The major conclusion from this systematic review is that there is limited scientific evidence to indicate the most valid and reliable methods and tests that assist in the **clinical** evaluation of hypotonia in the paediatric population. Only two studies investigated characteristics or criteria that may be used in drawing conclusions about a child's hypotonic status, one of which was a follow-up study of the original one that attempted to highlight characteristics associated with low muscle tone. These results may be clinically important when looking at cost and the associated risk of invasive and unnecessary testing with diagnostic tools[20,26,34] as indicated in the literature. Whilst the review does indicate the gains made in the last decade, especially with regard to the retrospective studies mentioned here, there remains insufficient scientific evidence, in the form of systematic reviews and randomised control trials in answering the clinical question adequately.

Implications for Practice and Research

This review highlights the gaps in the literature related to the evidence for assessment of hypotonia in the paediatric population. Objective assessment instruments that are both sensitive and specific in detecting hypotonicity in children are needed. This review may assist a multi-disciplinary team by providing information on the available evidence in assessing hypotonia in children. This review provides initial data and evidence on the gaps so that the scientific community may move towards conducting studies with greater methodological rigor in order to determine best practice with respect to assessment methods and in identifying criteria in the assessment of low muscle tone in the paediatric population.

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CONFLICT OF INTEREST

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ABSTRACT

Although quality management is used in occupational therapy in South Africa, no comprehensive description or standardisation of it exists and literature in the context of this topic is scarce. As a consequence of this, the purpose of this study was to describe the extent of occupational therapists' involvement in quality management.
A quantitative study in the form of a survey was carried out. A convenience sample of 80 occupational therapists was surveyed, using a structured questionnaire. Results of the study indicated that most occupational therapists have some knowledge of quality frameworks. Standardisation of documentation and its auditing appear to be one of a number of problems. Another challenge is that occupational therapists may work in relative professional isolation making it problematic to implement quality management.
Recommendations were made for occupational therapy practice and further research, as well as a proposed quality management framework for occupational therapy in South Africa.

Key words: Quality management, occupational therapy, audit, minimum standards, professional development

INTRODUCTION

Historically, quality in healthcare has been of concern for almost as long as humans have been promoting health and healing the sick.

Increasing litigation, an emphasis on the consumer in healthcare and the need for fiscal restraint makes quality management an essential component of practice for healthcare professionals[1]. Spiralling healthcare costs globally and locally have highlighted the need to manage the inefficiencies in health services that drain resources. Costly and inefficient health services mean that fewer individuals are able to benefit from them[2]. Assessing the quality of care has become progressively more important to providers, regulators and purchasers of care, with a greater focus on evidence-based medicine and cost-effectiveness[3].

Allied health professionals, including occupational therapists (OTs) are becoming more exposed to the necessity of explaining and demonstrating the value they bring as experts and professionals. This means that the interventions that therapy professionals provide must have a strong base of evidence of their effectiveness, and outcomes should be measurable[4]. In South Africa the re-structuring of the entire health system is impending in the form of a National Health Insurance scheme, priority aims of which include access to quality healthcare and the minimising of financial risk[5]. In such a climate it is more important than ever before that therapy and rehabilitation services are of a suitably high quality, are cost-effective and provide discernible positive outcomes for those receiving them. Quality activity will continue to grow, not only being profession-specific with the focus on clinical care, but also as a management concept in healthcare, critical to evaluating and maintaining efficacy and efficiency[6,7].

There is a general lack of research evidence as to which frameworks and quality methods are most effective[8,9]. Additionally there is a paucity of valid and reliable measurement techniques, a lack of definition of key indicators for quality in occupational therapy (OT) both locally and internationally and very few guidelines on the methods used for quality management.

Measuring the outcome of treatment and health services is challenging. In occupational therapy, quality of life through improved function and adaptive responses is a key aim of treatment. However, it is not always straightforward to achieve consensus as to what the desired outcomes are and there are often difficulties with confounding influences – factors outside of treatment which might influence the patients' progress[1]. This means that structure- and process-orientated aspects of service delivery, such as treatment planning and assessment, environment/equipment, timeframes, patient satisfaction and throughput of patient numbers, risk being prioritised over the actual outcome of treatment. Conversely, in some circumstances a high standard for such processes is actually associated with a better outcome for the patient[10], meaning that if service delivery processes are being carried out well, it is more likely that the patient is gaining from their actual treatment, even if it is difficult to measure the outcome directly. One example of a locally developed quality initiative that looks at structure (such as treatment environment and facilities), process (such as assessment, treatment planning and implementation) and outcome is Beukes' work, which provides research-based consensus for developing and measuring standards for vocational assessment[11].

This structure–process–outcome framework for quality in healthcare, originally developed by Donabedian, is largely interpreted as an inspection-based or standards-based approach to quality evaluation[12], other examples in South Africa are that of the Council for the Accreditation of Health Services in South Africa (COHSASA) and the National Department of Health's National Core Standards initiative. However, other frameworks for quality management exist and include industry-derived models, such