well as correct or accommodate deformity and/or compensate for impairments of the ankle-foot complex.[1] AFOs are needed by individuals with a variety of conditions of neurologic and traumatic etiology. Although they have the capacity to improve a person's functioning,[4] no data are available to consumers or referring clinicians to help identify high-quality service delivery of AFOs.

To improve quality of orthotic service delivery, professional organizations responsible for accreditation of orthotic patient care facilities have developed standards that emphasize patient feedback.[5] Patient feedback is typically obtained through patient satisfaction surveys. However, satisfaction with a device represents only one aspect of health care quality.[6]

Health care quality can be defined as the "degree to which a desired health care process or outcome is achieved or the extent that a desirable structure to support health care delivery is in place."[7(p121)] Two frameworks for considering health care quality include those described by Donabedian[8] and the National Quality Forum (NQF).[9] The Donabedian framework describes quality across 3 domains: structure, process, and outcome. Structure measures track whether a particular mechanism or system is in place, such as whether an organization is using electronic medical records; process measures track performance of a particular action, such as fabrication of devices in a timely manner; and outcome measures consider the end results of care, such as functional ability, gait quality, falls, pain, and patient experience with devices and services. The NQF offers a framework for quality measurement focused on person- and family-centered care.[9] High priority topics identified by the NQF framework include interpersonal relationships, patient and family engagement, care planning and delivery, access to support, and quality of life (table 1).

Objective 1: identify instruments

With the assistance of a medical librarian, the following databases were searched: PubMed, the Cumulative Index to Nursing and Allied Health Literature, Embase, Cochrane Systematic Reviews, Cochrane Central Register of Controlled Trials, and the Physiotherapy Evidence Database. The search strategy contained search terms that defined the population (neurologic and traumatic conditions), the device (AFO), and terms related to functioning and quality of care. Conditions with a neurologic etiology were identified by terms that included stroke, nervous system diseases, nerve injury, and nerve damage, whereas conditions with a traumatic etiology were identified by terms that included wounds, injuries, limb salvage, trauma, polytrauma, and fractures. Table 2 shows the search string used in PubMed; similar search strings were used in the other databases. Duplicate citations were removed after combining searches across the databases.

The inclusion criteria were use of an AFO (also referred to as a short leg brace), age of 18 years or older with neurologic or traumatic conditions, and use of an instrument to assess experiences or outcomes in an inpatient or outpatient setting.

The exclusion criteria were editorials, descriptive reports, protocols without data, and review articles because they were unlikely to mention relevant data elements (eg, AFO description, instrument used), animal studies, articles that assessed robotic or externally powered AFOs, knee-ankle-foot orthoses or hip-knee-ankle-foot orthoses, and instruments that required expensive or

confirmed one another's selections, and resolved any discrepancies by consensus. For each article, the population, type of AFO (custom-made or prefabricated), and instruments used were recorded.

The reviewers generated a list of identified instruments and assessed the frequency of their use within the included articles. Given that the intent was to identify instruments that are broadly applicable and could be routinely administered across patients, clinicians, and service providers, we presumed frequency of use to be a reasonable indicator of broad usefulness and feasibility of an instrument. Hence, instruments used 4 or more times were included and categorized by method of data collection, ICF code,[10] Donabedian's 3 aspects of quality,[8] and the NQF's person- and family-centered care domains.[9]

Objective 2: psychometric properties of identified instruments

To summarize the psychometric properties of the final list of instruments identified by the first scoping review, a medical librarian searched the following databases: PubMed, Cumulative Index to Nursing and Allied Health Literature, Embase, and Cochrane Systematic Reviews. The search strategies contained terms that defined the name of the instrument and neurologic and traumatic conditions, as well as the COSMIN filter, which was developed for finding measurement properties of assessment instruments,[18] and filtering for review articles. Table 3 shows the search string and COSMIN filter used in PubMed for 1 instrument. Similar search strings were used in all databases for each instrument. When a search found no review articles, the review filter was removed and the search was repeated for articles describing original reports that assessed the psychometric properties of that instrument. Duplicate

self-report that comes directly from the patient or study subject; and clinician-reported, defined as being based on a report that comes from a trained health care professional after observation of a patient or subject's health condition.[19] To augment the information from the search, reviewers also consulted repositories such

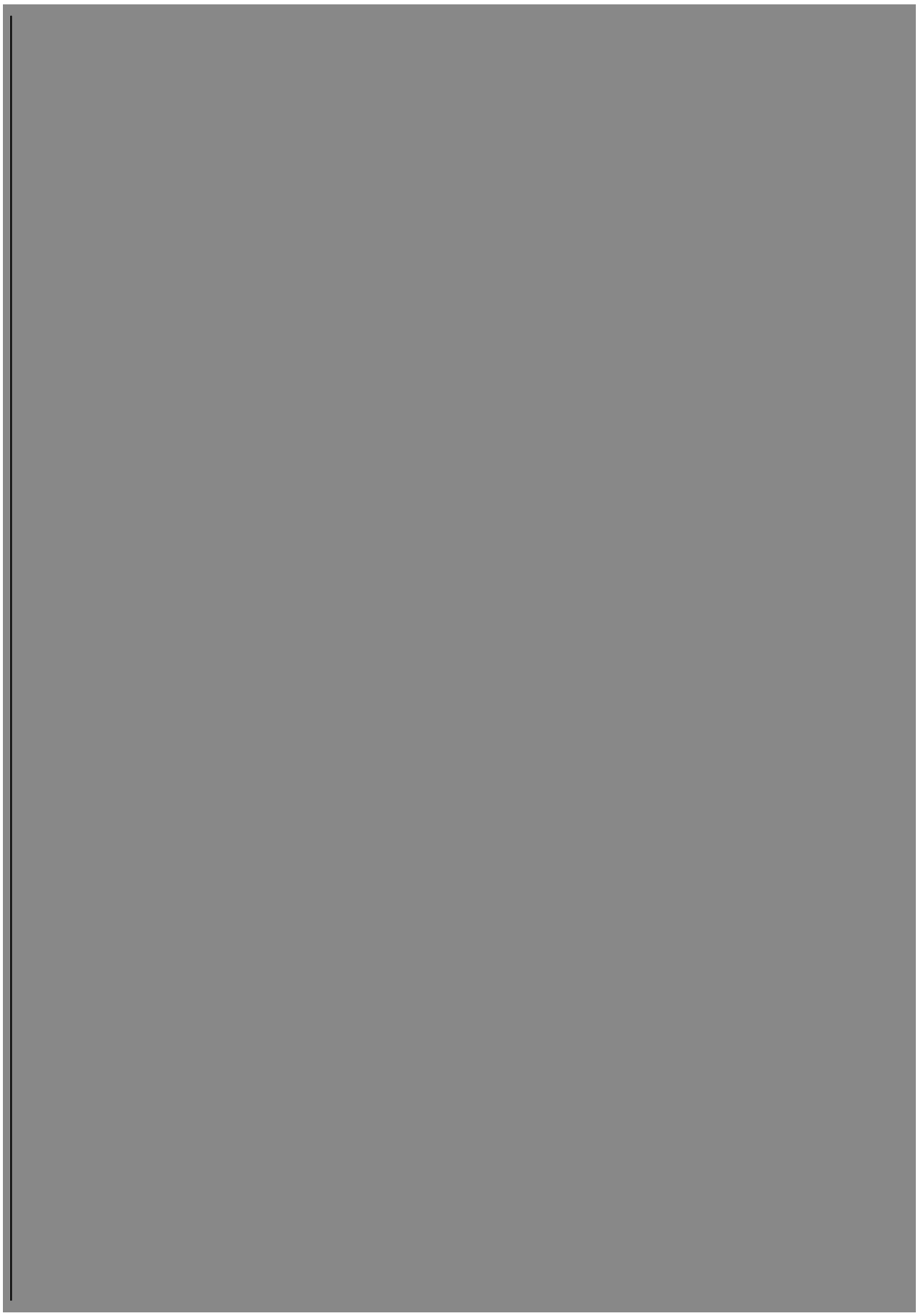

Table 5 (*con in ed*)

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(0.3 … ; 0.16 …), 90

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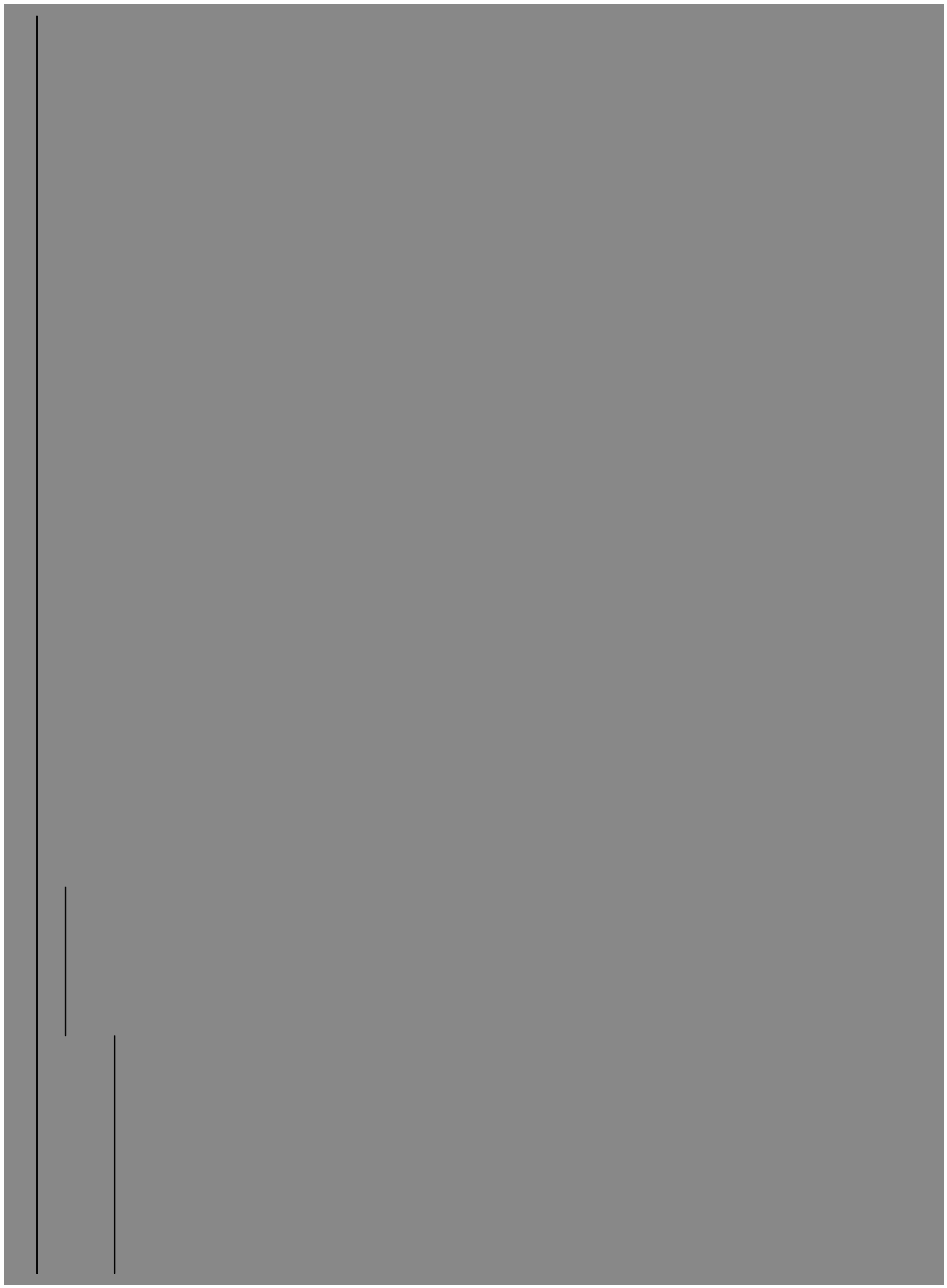

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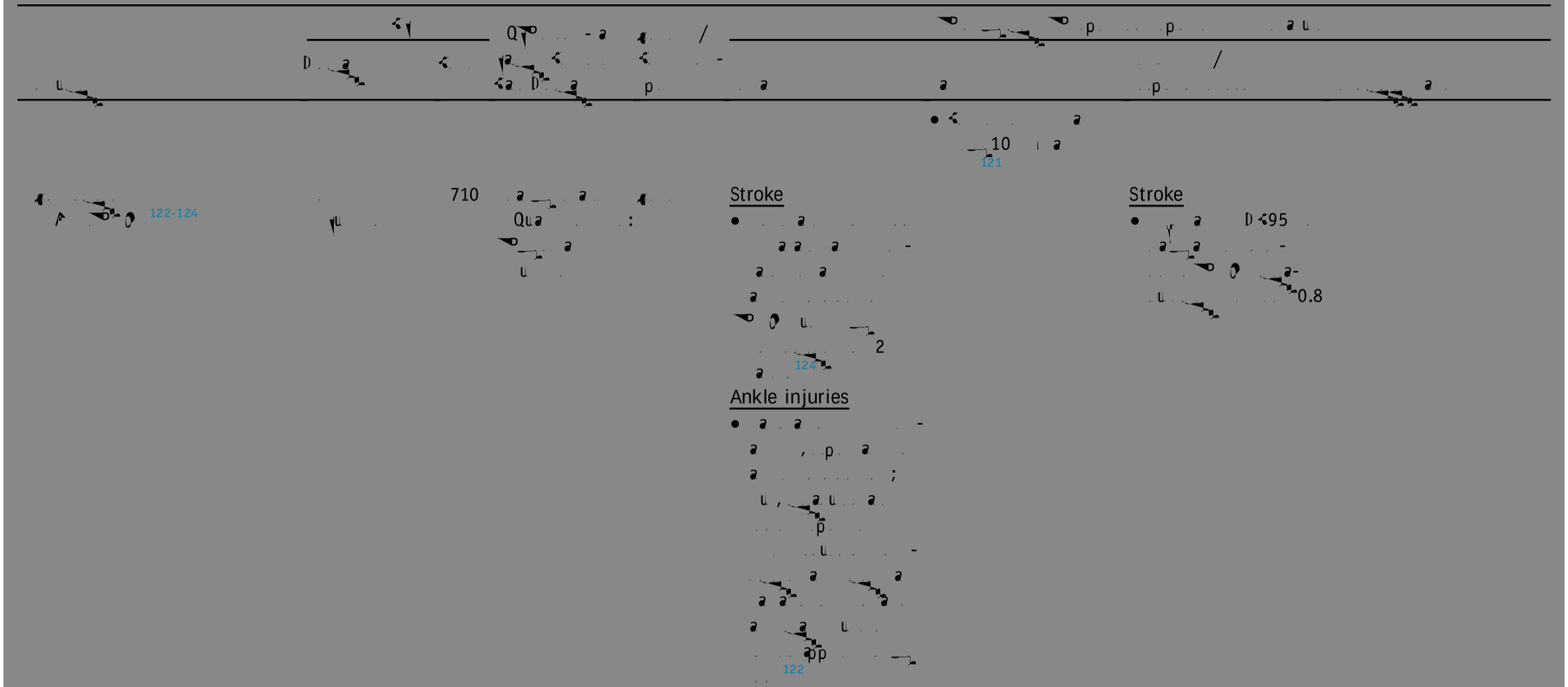

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[illegible]	[illegible]	450	[illegible] Qu[illegible] : [illegible]		
Clinician-Reported Instrument					
[illegible][135]	[illegible] /	7350	[illegible] Qu[illegible] : [illegible]	Stroke • [illegible] [illegible][135]	Stroke • [illegible][135] • [illegible][135]	• [illegible] =902 • [illegible] *b* *no* [illegible]
[illegible][103,105,112,118]	[illegible]	498	[illegible] Qu[illegible] : [illegible]	Stroke • [illegible][103,112] • [illegible][103]	Stroke	

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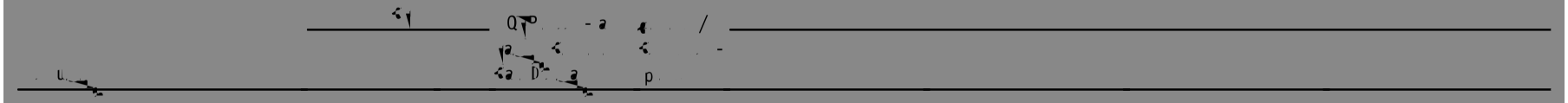

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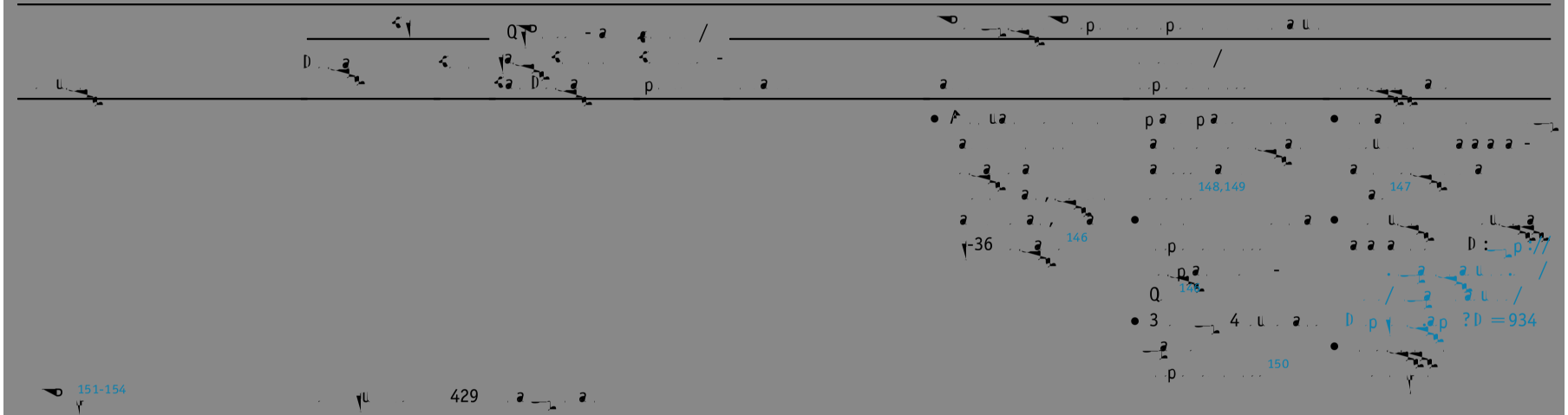

from the 5 instruments we identified (ie, the 10MWT, 6MWT, BBS, TUG, and RMI) may be useful to evaluate care quality for individuals who use AFOs in terms of assessing “the degree to

Study limitations

After completing the corresponding reviews, investigators and a stakeholder advisory committee addressed the overarching goal of evaluating the extent to which the psychometrically sound instruments might be suitable for use in developing quality measures for AFO users. We acknowledge that the criteria we used (ie, instrument is easy to access, does not require expensive or complex equipment or training to administer, requires a reasonably short time to administer, and is simple to score) are

Experience of care instruments suitable for this population were not identified but are needed for a comprehensive evaluation of care quality for AFO users.

Keywords

Braces; Health care; Outcome assessment; Quality of health care; Rehabilitation

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References

1. Condie D. International Organization for Standardization (ISO) Terminology. In: Hsu J, Michael J, Fisk J, editors. AAOS Atlas of Orthoses and Assistive Devices. 4th ed. Philadelphia, PA: Mosby Elsevier; 2008. p 3-7.
2. Holtkamp F, Verkerk M, van Hoof J, Wouters E. Mapping user activities and user environments during the client intake and examination phase: an exploratory study from the perspective of ankle foot orthosis users. Technol Disabil 2016;28:145-57.
3. Whiteside S, Allen M, Bick J, et al. Practice analysis of certified practitioners in the disciplines of orthotics and prosthetics. Alexandria, VA: American Board for Certification in Orthotics, Prosthetics & Pedorthics, Inc.; 2015.
4. Tyson S, Sadeghi-Demneh E, Nester C. A systematic review and meta-analysis of the effect of an ankle-foot orthosis on gait biomechanics after stroke. Clin Rehabil 2013;27:879-91.
5. American Board for Certification in Prosthetics Orthotics and Ped-

24. Cattaneo D, Marazzini F, Crippa A, Cardini R. Do static or dynamic AFOs improve balance? Clin Rehabil 2002;16:894-9.
25. Chakraborty PP, Ray S, Biswas D, et al. A comparative study

62. Dogan A, Mengulluoglu M, Ozgirgin N. Evaluation of the effect of ankle-foot orthosis use on balance and mobility in hemiparetic stroke patients. Disabil Rehabil 2011;33:1433-9.
63. Lan Y, Xu GQ, Huang DF, et al. Association between improved trunk stability and walking capacity using ankle-foot orthosis in hemiparetic patients with stroke: evidence from three-dimensional gait analysis. Chin Med J (Engl) 2013;126:3869-73.
64. Park JH, Chun MH, Ahn JS, Yu JY, Kang SH. Comparison of gait analysis between anterior and posterior ankle foot orthosis in hemiplegic patients. Am J Phys Med Rehabil 2009;88:630-4.
65. Phillips MF, Robertson Z, Killen B, White B. A pilot study of a crossover trial with randomized use of ankle-foot orthoses for people with Charcot-Marie-tooth disease. Clin Rehabil 2012;26:534-44.
66. Bouchalova V, Houben E, Tancsik D, Schaekers L, Meuws L, Feys P. The influence of an ankle-foot orthosis on the spatiotemporal gait parameters and functional balance in chronic stroke patients. J Phys Ther Sci 2016;28:1621-8.
67. Chen CL, Teng YL, Lou SZ, Chang HY, Chen FF, Yeung KT. Effects

101. Jackson AB, Carnel CT, Ditunno JF, et al. Outcome measures for gait and ambulation in the spinal cord injury population. J Spinal Cord Med 2008;31:487-99.
102. Kalsi-Ryan S, Wilson J, Yang JM, Fehlings MG. Neurological grading in traumatic spinal cord injury. World Neurosurg 2014;82: 509-18.
103. Geroin C, Mazzoleni S, Smania N, et al. Systematic review of outcome measures of walking training using electromechanical and robotic devices in patients with stroke. J Rehabil Med 2013;45: 987-96.
104. Scrivener K, Sherrington C, Schurr K. A systematic review of the responsiveness of lower limb physical performance measures in inpatient care after stroke. BMC Neurol 2013;13:4.
105. Tyson S, Connell L. The psychometric properties and clinical utility of measures of walking and mobility in neurological conditions: a systematic review. Clin Rehabil 2009;23:1018-33.
106. Kieseier BC, Pozzilli C. Assessing walking disability in multiple sclerosis. Mult Scler 2012;18:914-24.
107. Bloem BR, Marinus J, Almeida Q, et al. Measurement instruments to assess posture, gait, and balance in Parkinson's disease: critique and recommendations. Mov Disord 2016;31:1342-55.
108. Lee J, Geller AI, Strasser DC. Analytical review: focus on fall screening assessments. Phys Med Rehabil 2013;5:609-21.
109. Salbach NM, O'Brien K, Brooks D, et al. Reliability, measurement error and sensitivity to change of time-limited walk tests in people with stroke: a systematic review. Cerebrovasc Dis 2013;35:765.
110. Lennon N, Thorpe D, Balemans AC, et al. The clinimetric properties of aerobic and anaerobic fitness measures in adults with cerebral palsy: a systematic review of the literature. Res Dev Disabil 2015;45-46:316-28.
111. Salbach NM, O'Brien KK, Brooks D, et al. Considerations for the selection of time-limited walk tests poststroke: a systematic review of test protocols and measurement properties. J Neurol Phys Ther 2017;41:3-17.
112. van Bloemendaal M, van de Water AT, van de Port IG. Walking tests for stroke survivors: a systematic review of their measurement properties. Disabil Rehabil 2012;34:2207-21.
113. Goldman MD, Motl RW, Rudick RA. Possible clinical outcome measures for clinical trials in patients with multiple sclerosis. Ther Adv Neurol Diso 2010;3:229-39.
114. Paul L, Coote S, Crosbie J, et al. Core outcome measures for exercise studies in people with multiple sclerosis: recommendations from a multidisciplinary consensus meeting. Mult Scler 2014;20: 1641-50.
115. Blum L, Korner-Bitensky N. Usefulness of the Berg Balance Scale in stroke rehabilitation: a systematic review. Phys Ther 2008;88:559-66.
116. Pollock C, Eng J, Garland S. Clinical measurement of walking balance in people post stroke: a systematic review. Clin Rehabil 2011; 25:693-708.
117. Kalsi-Ryan S, Singh A, Massicotte EM, et al. Ancillary outcome measures for assessment of individuals with cervical spondylotic myelopathy. Spine 2013;38(22 Suppl 1):S111-22.
118. Yelnik A, Bonan I. Clinical tools for assessing balance disorders. Neurophys Clin 2008;38:439-45.
119. Hafsteinsdottir TB, Rensink M, Schuurmans M. Clinimetric properties of the Timed Up and Go Test for p(t)-119.entbal-

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