UCB Myasthenia Gravis endpoints brochure

For proactive MSL use with HCP's

Inspired by **patients.**
Driven by **science.**

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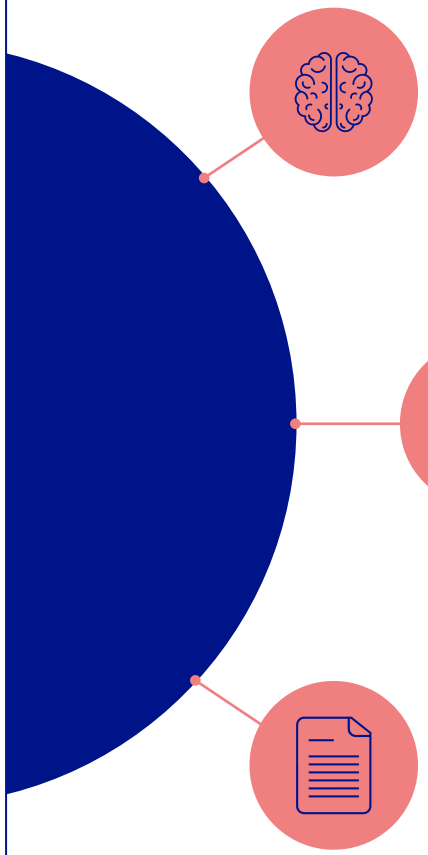
Contents

Introduction



MG is a rare, chronic, and heterogenous autoimmune disease of the neuromuscular junction. Clinical presentation of MG ranges from mild ocular deficits to severe widespread weakness and myasthenic crisis.[1–3]

Over the past few decades, various clinical scales have been developed that reflect clinician-reported (objective), patient-reported and composite measures of MG disease severity.[2]

This brochure is intended to serve as an educational resource for healthcare providers involved in the management of patients with MG, supplemented by practical implications of how scales are used, and any limitations that may apply.

gMG, generalized myasthenia gravis; MG, myasthenia gravis.

1. Juel VC, Massey JM. Orphanet J Rare Dis. 2007;2:44. 2. Thomsen JLS, Andersen H. Front Neurol. 2020;11:596382. 3. Cleanthous S, et al. Orphanet J Rare Dis. 2021;16:457.

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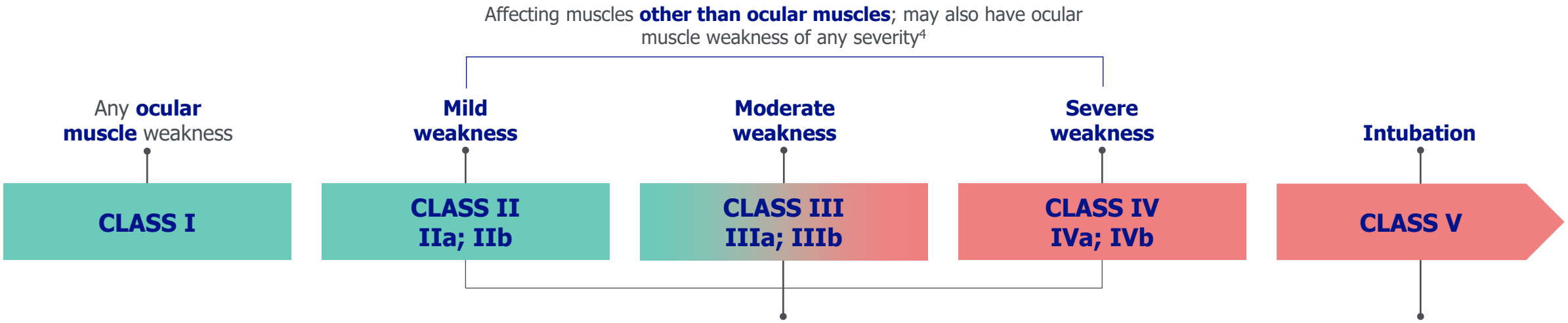
MGFA classification and endpoints in MG clinical trials

An endpoint is a precisely defined variable intended to reflect an outcome of interest that is statistically analyzed to address a specific research question.[1] An outcome measure is the tool used to measure the outcomes in the endpoint.[1] In clinical trials, endpoints are used to evaluate treatment efficacy and/or safety.[2]

Since MG symptoms fluctuate over time, clinical assessment of these symptoms with single time-point measures can be insufficient.[3]

Given the heterogeneity in presentation and subjective and varied nature of patients' experiences of MG symptoms, many MG measures utilize patient-reported measures of symptoms.[3]

In 1997, a task force was established to develop a uniform set of classifications to identify patient subgroups that may indicate different prognoses or response to therapy, for clinical trials in MG (MGFA classification system):[4*]



Subtype a: Predominantly affecting **limb, axial muscles, or both**. May also have lesser involvement of oropharyngeal muscles

Subtype b: Predominantly affecting **oropharyngeal, respiratory muscles, or both**. May also have lesser or equal involvement of limb, axial muscles, or both

With or without mechanical ventilation, except when employed during routine postoperative management

The use of a feeding tube without intubation places the patient in class IVb.

*The MGFA classification system should not be used to measure outcome.
MG, myasthenia gravis; MGFA, the Myasthenia Gravis Foundation of America.
1. FDA-NIH Biomarker Working Group. BEST (Biomarkers, EndpointS, and other Tools) Resource [Internet]. Silver Spring (MD): Food and Drug Administration (US); 2016-. Glossary. 2016 Jan 28 [Updated 2021 Nov 29]. Co-published by National Institutes of Health (US), Bethesda (MD). Available from: https://www.ncbi.nlm.nih.gov/books/NBK338448/pdf/Bookshelf_NBK338448.pdf. Accessed Aug 2023. 2. Thomsen JLS, Andersen H. Front Neurol. 2020;11:596382. 3. Barnett C, et al. Neurol Clin. 2018;36:339–53. 4. Jaretzki A III et al. Neurology. 2000;55:16–23.

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Overview of MG-specific outcome measures

Patient-reported outcome (PRO): comes directly from the patient, without amendment or interpretation by a clinician or anyone else[1]

Clinician-reported outcome (ClinRO): comes from a trained healthcare professional after observation of a patient's health condition[2]

Performance outcome (PerfO): A measurement based on standardized task(s) actively undertaken by a patient according to a set of instructions[3]

Instrument	Signs and symptoms assessed	Score	Recall period	Assessment type
MG-ADL	Ocular, bulbar, respiratory, gross motor/limb impairment[4,5]	0–24	Current	PRO†
QMG	Ocular, bulbar,* respiratory,* gross motor/limbs, axial[4,6,7]	0–39	Current	ClinRO & PerfO
MGC	Ocular, bulbar,† respiratory,† limbs, neck[4,6,8]	0–50	Current	ClinRO & patient history
MGII	Ocular,‡§ bulbar,‡ respiratory, limb impairment,‡§ neck§[6,9]	0–84	Current/ 2-week	ClinRO & PRO
MG Symptoms PRO	Ocular, bulbar, respiratory, limbs, neck¶[10,11]	0–100‖	Current	PRO

Higher score: More severe disease

*PerfO.[7] †Patient history is utilised by the clinician for talking, chewing, swallowing and breathing items. These items can be completed based on subjective patient reports from the MG-ADL.[6,8] ‡Includes fatigability.[6] §ClinRO.[9] ¶Includes 42 items that cover five cardinal symptomatic concepts of MG, which are each independently assessed by a subscale: three related to muscle weakness—Ocular Muscle Weakness (3 items), Bulbar Muscle Weakness (10 items), Respiratory Muscle Weakness (3 items)—plus two additional scores related to Physical Fatigue (15 items) and Muscle Weakness Fatigability (9 items).[11] ‖ A score is calculated for each subscale.[11]

ADL, activities of daily living; HCP, healthcare professional; MG, myasthenia gravis; MGC, MG composite; MGII, MG impairment index; MG Symptoms PRO, MG symptoms patient-reported outcomes; QMG, quantitative MG.

1. FDA. Patient-reported outcome. Available at: https://www.ncbi.nlm.nih.gov/books/NBK338448/def-item/glossary.patientreported-outcome/ Accessed Aug2023. 2. FDA. Clinician-reported outcome. Available at: https://www.ncbi.nlm.nih.gov/books/NBK338448/def-item/glossary.clinicianreported-outcome/. Accessed Aug 2023. 3. FDA. Performance outcomes. https://www.ncbi.nlm.nih.gov/books/NBK338448/def-item/glossary.performance-outcome/. Accessed Aug 2023; 4. Thomsen JLS, Andersen H. Front Neurol. 2020;11:596382. 5. Wolfe GI, et al. Neurology. 1999;22;52:1487–9. 6. Barnett C, et al. Neurol Clin. 2018;36:339–53. 7. Barohn RJ, et al. Ann N Y Acad Sci. 1998;841:769–72. 8. Burns TM, et al. Neurology. 2010;74:1434–40. 9. Barnett C, et al. Neurology. 2016;87:879–86 (including supplementary material). 9. Burns TM, et al. Muscle Nerve. 2008;38:1553–62. 10. Cleanthous S, et al. Orphanet J Rare Dis. 2021;16:457. 11. Regnault A, et al. Neurol Ther https://doi.org/10.1007/s40120-023-00464-x.

Overview of MG HRQoL outcome measures

Patient-reported outcome (PRO): comes directly from the patient, without amendment or interpretation by a clinician or anyone else[1]

Clinician-reported outcome (ClinRO): comes from a trained healthcare professional after observation of a patient's health condition[2]

Performance outcome (PerfO): A measurement based on standardised task(s) actively undertaken by a patient according to a set of instructions[3]

Instrument	Signs and symptoms assessed	Score	Recall period	Assessment type
MG-QoL 15r	HRQoL as determined by physical, psychological, and social aspects of functioning[4,5]	0–30	Current	PRO
Neuro-QoL-Fatigue-SF	General fatigue across eight patient-reported items[6]	8–40	7-day	PRO
EQ-5D-5L	A generic HRQoL tool across five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression[7]	0–100	Current	PRO

Higher score: More severe disease

EQ-5D-5L, EuroQol 5-dimension 5-level; HRQoL, health-related QoL; MG, myasthenia gravis; MG-QoL15r, MG QoL 15-item scale revised; neuro-QoL, QoL in neurological disorders; QoL, quality of life.

1. FDA. Patient-reported outcome. Available at: https://www.ncbi.nlm.nih.gov/books/NBK338448/def-item/glossary.patientreported-outcome/ Accessed Aug 2023. 2. FDA. Clinician-reported outcome. Available at: https://www.ncbi.nlm.nih.gov/books/NBK338448/def-item/glossary.clinicianreported-outcome/. Accessed Aug 2023. 3. FDA. Performance outcomes. https://www.ncbi.nlm.nih.gov/books/NBK338448/def-item/glossary.performance-outcome/. Accessed May 2023; 4. Burns TM, et al. Muscle Nerve. 2010;41:219–26. 5. Burns TM, et al. Muscle Nerve. 2016;54:1015–22. 6. Tran C, et al. Muscle Nerve. 2018 ;58(2):197–203. 7. Herdman M, et al. Qual Life Res. 2011;20:1727–36.

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Summary of MG outcome measures

Myasthenia Gravis Activities of Daily Living (MG-ADL)

- MG-ADL is a patient-reported measure* that assesses MG symptoms and functional status on a scale from 0–24.[1]
- The survey is comprised of eight items, scored from 0 (normal) to 3 (most severe) – the higher the total score (out of 24), the greater the severity.[1]
- No specified recall time, although often based on the patient's recall of symptoms during the prior week[2,3]
- A 2-point change is clinically meaningful.[4]
- MG-ADL is easy to administer (under 10 minutes).[1]

MG-ADL[1]					
Grade	**0**	**1**	**2**	**3**	**Score**
Talking	Normal	Intermittent slurring or nasal speech	Constant slurring or nasal speech, but can be understood	Difficult-to-understand speech	
Chewing	Normal	Fatigue with solid food	Fatigue with soft food	Gastric tube	
Swallowing	Normal	Rare episode of choking	Frequent choking necessitating changes in diet	Gastric tube	
Breathing	Normal	Shortness of breath with exertion	Shortness of breath at rest	Ventilator dependence	
Impairment of ability to brush teeth or comb hair	None	Extra effort, but no rest periods needed	Rest periods needed	Cannot do one of these functions	
Impairment of ability to arise from a chair	None	Mild, sometimes uses arms	Moderate, always uses arms	Severe, requires assistance	
Double vision	None	Occurs, but not daily	Daily, but not constant	Constant	
Eyelid droop	None	Occurs, but not daily	Daily, but not constant	Constant	
Total score					

Insights into use in clinical practice and research settings

- MG-ADL is a useful and versatile measure that can be used in clinical practice or as an outcome in clinical trials/observational studies to measure MG symptoms and response to treatment.[5]
- Use of MG-ADL as a primary outcome measure has evolved in recent years and is now used frequently in MG clinical trials. It also aligns with the FDA's guidance to include patients' perspectives and experience with a disease into drug development.[5,6]
- The MG-ADL is analyzed using a responder threshold and change from baseline to indicate a clinically meaningful improvement.[5]
- "Minimal symptom expression" has been used as an endpoint in some clinical trials; it is defined as an MG-ADL total score of 0–1.[5]
- Limitations of MG-ADL include being prone to floor effects leading to it being insensitive to change; several symptoms of MG are not assessed (e.g., fatigue), and the negative consequences of treatment (e.g., side-effects) are not addressed.[7]

Adapted from Wolfe GI, et al. 1999

*Administered by HCP.
ADL, activities of daily living; FDA, Food and Drug Administration; MG, myasthenia gravis.

1. Wolfe GI, et al. Neurology. 1999;52:1487–9. 2. MG Activities of Daily Living (MG-ADL) Scale. Available at: https://www.myastheniagravis.org/mg-activities-of-daily-living-mg-adl-scale. Accessed April 2023 3. Barnett C, et al. Neurol Clin. 2018;36:339–53. 4. Muppidi S, et al. Muscle Nerve. 2011;44(5):727–31. 5. Muppidi S, et al. Muscle Nerve. 2022;65:630–39. 6. Thomsen JLS, Andersen H. Front Neurol. 2020;11:596382. 6. FDA. Plan for Issuance of Patient-Focused Drug Development Guidance: Under 21st Century Cures Act Title III Section 3002. 2017. Available at: https://www.fda.gov/media/105979/download. Accessed Aug 2023. 7. Barnett C, et al. Neurol Clin. 2018;36:339–53.

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Quantitative Myasthenia Gravis Score (QMG)

- QMG is a clinician-assessed measure of muscle strength and fatigability.[1,2]
  - The 13 items include ocular, bulbar, limb, neck, and respiratory function.[1]
  - Each muscle group is scored on a scale of 0–3, for a total unweighted score of 0–39.[1,2]
  - The higher the total score (out of 39), the greater the severity[2]
  - No recall time is specified[1,2]
- A 2-point change is clinically meaningful in patients with mild-to-moderate disease, while a 3-point difference is meaningful in patients with more severe disease.[1,3]
- Reliability of the test is high and there is low interobserver variability.[1]

QMG[2]				
Test item weakness	**None**	**Mild**	**Moderate**	**Severe**
Double vision on lateral gaze right or left (circle one)	61 sec	11–60 sec	1–10 sec	Spontaneous
Ptosis (upward gaze)	61 sec	11–60 sec	1–10 sec	Spontaneous
Facial muscles	Normal lid	Complete, weak, some resistance	Complete, without resistance	Incomplete
Swallowing 4 oz water (1/2 cup)	Normal	Minor coughing or throat clearing	Severe coughing/choking or nasal regurgitation	Cannot swallow (test not attempted)
Speech following counting aloud from 1 to 50 (onset of dysarthria)	None at #50	Dysarthria at #30–49	Dysarthria at #10–29	Dysarthria at #9
Right arm outstretched (90º sitting)	240 sec	90–239 sec	10–89 sec	0–9 sec
Left arm outstretched (90º sitting)	240 sec	90–239 sec	10–89 sec	0–9 sec
Vital capacity (% predicted)	≥80%	65–79%	50–64%	<50%
Right-hand grip (kgw) Male Female	 ≥45 ≥30	 15–44 10–29	 5–14 5–9	 0–4 0–4
Left-hand grip (kgw) Male Female	 ≥35 ≥25	 15–34 10–24	 5–14 5–9	 0–4 0–4
Head, lifted (45º supine)	120 sec	30–119 sec	1–29 sec	0 sec
Right leg outstretched (45º supine)	100 sec	31–99 sec	1–30 sec	0 sec
Left leg outstretched (45º supine)	100 sec	31–99 sec	1–30 sec	0 sec
Total score				

Insights into use in clinical practice and research settings

- QMG score has been shown to be responsive to change in several clinical trials.[3]
- Although well-validated and often used in clinical trials, QMG is more time intensive than MG-ADL, requires training to administer, is clinician-derived, and is not practical for routine use in clinical practice.[4]
  - The scale is mostly used in research as it requires a dynamometer and spirometer, and can take up to 25 minutes to complete.[3]
- QMG may be more sensitive to changes in ocular, limb, and axial muscles than to changes in bulbar and respiratory functions, as objective assessments of respiratory and bulbar functions are still lacking.[1]
- Patient fatigue is not assessed.[1]

Adapted from Barohn RJ, et al. 1998

ADL, activities of daily living; MG, myasthenia gravis; QMG, quantitative MG.

1. Thomsen JLS, Andersen H. Front Neurol. 2020;11:596382. 2. Barohn RJ, et al. Ann N Y Acad Sci. 1998;841:769–72. 3. Barnett C, et al. Neurol Clin. 2018;36:339–53. 4. Muppidi S, et al. Muscle Nerve. 2022;65:630–9.

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Myasthenia Gravis Composite (MGC)

- MGC is a hybrid of six clinician- and four patient-reported items from the patient's medical history, that covers the ten items of most relevance to people living with MG.[1,2]
  - The outcome measure incorporates items from MG-ADL, QMG, and the Manual Muscle Test.[1,3]
  - The clinician-reported assessments evaluate ocular, neck, and proximal limb muscles; patient-reported items are derived from MG-ADL and/or collected by clinicians from patient history, and assess bulbar and respiratory functions.[2,3]
  - Test items are weighted based on input from global MG experts, considering factors such as QoL, disease severity, risk, prognosis, estimated validity, and reliability; with a total score that ranges from 0–50.[1,3]
  - No recall time is specified[1]
- A 3-point improvement in MGC is considered to be clinically meaningful.[2]

MGC[2]				
Ptosis, upward ease (physician examination)	>45 seconds = 0	11–45 seconds = 1	1–10 seconds = 2	Immediate = 3
Double vision on lateral gaze, left or right (physician examination)	>45 seconds = 0	11–45 seconds = 1	1–10 seconds = 3	Immediate = 4
Eye closure (physician examination)	Normal = 0	Mild weakness (can be forced open with effort) = 0	Moderate weakness (can be forced open easily) = 1	Severe weakness (unable to keep eyes closed) = 2
Talking (patient history)	Normal = 0	Intermittent slurring or nasal speech = 2	Constant slurring or nasal speech, but can be understood = 4	Difficult-to-understand speech = 6
Chewing (patient history)	Normal = 0	Fatigue with solid food = 2	Fatigue with soft food = 4	Gastric tube = 6
Swallowing (patient history)	Normal = 0	Rare episode of choking or trouble swallowing = 2	Frequent trouble swallowing, for example necessitating change in diet = 5	Gastric tube = 6
Breathing (thought to be caused by MG)	Normal = 0	Shortness of breath with exertion = 2	Shortness of breath at rest = 4	Ventilator dependence = 9
Neck flexion or extension (weakest) (physician examination)	Normal = 0	Mild weakness = 1	Moderate weakness* (i.e., ~50% weak, ±15%) = 3	Severe weakness = 4
Shoulder abduction (physician examination)	Normal = 0	Mild weakness = 2	Moderate weakness* (i.e., ~50% weak, ±15%) = 4	Severe weakness = 5
Hip flexion (physician examination)	Normal = 0	Mild weakness = 2	Moderate weakness* (i.e., ~50% weak, ±15%) = 4	Severe weakness = 5

Insights into use in clinical practice and research settings

- The main strengths of MGC are its simplicity and the incorporation of the patient's history.[4]
- MGC is easy to administer (<5 min), easy to interpret (<10 seconds to calculate total score) and has been reported to have a high reliability.[2,3]
- The use of weighted scores may capture more clinically relevant information concerning disease severity.[3]
- MGC may serve as an alternative to linear disease measures, complementing both PROs, e.g., MGQoL-15r and Neuro-QoL-Fatigue-SF, and QMG.[3]
- The MGC items were selected based on their performance in 2 clinical trials that did not include patients with ocular-only, muscle-specific kinase-positive, double seronegative, or severe MG. Therefore, further study in these patient populations is required.[1]
- Patient fatigue is not assessed.[1]

Adapted from Burns TM, et al. 2010

*Moderate weakness for neck and limb items should be construed as weakness that equals approximately 50% ±15% of expected normal strength. Any weakness milder than that would be mild and any weakness more severe than that would be classified as severe.

ADL, activities of daily living; MG, myasthenia gravis; MGC, MG composite; MG-QoL15r, MG QoL 15-item scale revised; Neuro-QoL, QoL in neurological disorders; PRO, patient-reported outcome; QMG, quantitative MG score; QoL, quality of life; SF, short form.

1. Burns TM, et al. Muscle Nerve. 2008;38:1553–62. 2. Burns TM, et al. Neurology. 2010;74:1434–40. 3. Thomsen JLS, Andersen H. Front Neurol. 2020;11:596382. 4. Barnett C, et al. Neurol Clin. 2018;36:339–53.

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Myasthenia Gravis Impairment Index (MGII)

- A clinician- and patient-reported (composite score) to assess the severity of MG.[1]
  - MGII was developed in 2016.[2]
- MGII assesses the severity and fatiguability of ocular, bulbar, respiratory, limb, and neck impairments, with a 2-week recall time.[2,3]
- MGII has 22 patient-reported and six clinician-reported examination items divided into two sub-scores, ocular (eight items) and generalized (20 items).[1,2]
  - Total score range of 0–84 (high scores indicating more severe impairment); the minimal important difference for individuals is 5.5[1]
- MGII takes approximately 10 minutes to complete and has demonstrated feasibility, reliability, and construct validity in an outpatient setting.[2,3]
- MGII demonstrates gross discriminative validity with respect to patient groups and clinical classifications, as demonstrated by significant variability in MGII scores across MGFA classes and between patients with purely ocular or generalized MG.[2,3]

MGII[2]		
	PRO	ClinRO
Ocular*	Diplopia, ptosis	Diplopia in different directions, time to ptosis
Bulbar*	Swallowing, chewing,† voice changes, speech impairment	NA
Facial	NA	Lower face weakness
Respiratory	Breathing impairment severity	NA
Limb*	Arm and leg impairment	Arm and leg endurance
Neck	Weakness throughout the day	Neck endurance and strength
General	Overall physical fatigability	NA

Insights into use in clinical practice and research settings

- MGII has potential as an alternative to other secondary outcomes – it takes approximately 10 minutes to complete[3,4]
- MGII shows less floor-effect than both MG-ADL and MGC, and was recently shown to provide clinically relevant supplementary information to MG-ADL.[4]
- MGII may enable superior assessment of MG symptoms covering a larger spectrum of disease severity if used as a primary endpoint; however, this remains to be studied in randomized clinical trials.[4]
- As MGII was developed and tested in Canada, studies across other international populations are required to confirm the measurement properties in other contexts.[1,2]
  - The MGII was included as an efficacy outcome in the MycarinG phase 3 study to assess the safety and efficacy of rozanolixizumab in patients with gMG[5]

*Item assesses symptoms through the day, by activity and severity. †Severity and fatigability.
ADL, activities of daily living; ClinRO, clinician-reported outcome; MG, myasthenia gravis; MGC, MG composite; MGFA, MG Foundation of America; NA, not applicable; PRO, patient-reported outcome; QMG, quantitative MG.
1. Barnett C, et al. Neurology. 2017;89:2357–64. 2. Barnett C, et al. Neurology. 2016;87:879–86. 3. Barnett C, et al. Neurol Clin. 2018;36:339–53. 4. Thomsen JLS, Andersen H. Front Neurol. 2020;11:596382. 5. Bril V, et al. Lancet Neurol 2023;22:383–94.

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Myasthenia Gravis Symptoms Patient Reported Outcomes (MG Symptoms PRO)

- The patient-reported MG Symptoms PRO, developed in 2021*, consists of a series of questions asking patients to rate the severity of their symptoms.[1,2]
  - Patients are asked to report on the severity of ocular, bulbar, and respiratory muscle weakness, and how frequently they experienced physical fatigue and muscle weakness fatigability in the past 7 days.
- The results can be used to guide treatment decisions and monitor the effectiveness of treatments in clinical trials.[1,3]
  - The higher the total score (0–100 for each scale)[†], the greater the severity.[4]
  - Clinically meaningful within-patient improvement in scores have been defined for muscle weakness fatigability (-16.67); physical fatigue (-20.00); and bulbar muscle weakness (-20.00).[3‡]

- The MG symptoms PRO was developed with input from people with MG throughout the whole process leading to a truly patient-centric instrument, from the development of a conceptual model of MG through to the design of the actual instrument, including item terminology, item appropriateness and responses levels.[1]
- The MG symptoms PRO scales provide a more granular and detailed measurement of MG severity than existing measures, including a detailed assessment of physical fatigue.[1]

MG Symptoms PRO[1,2]

MG symptoms PRO scales	Underlying concepts	Items	Scale structure
Ocular muscle weakness	Vision (double, blurry); eyelid drooping, eye movements	5	4-point verbal rating scale (severity)[§]
Bulbar muscle weakness	Mouth drooping; voice (nasal, hoarse, weak); speech (slurred, pronunciation); chewing/swallowing difficulties	10	
Respiratory muscle weakness	Breathing difficulties; shortness of breath	3	
Muscle weakness fatigability	Limbs, axial, ocular, bulbar, respiratory	9	5-point verbal rating scale (frequency)[‖]
Physical fatigue	Physical tiredness; muscle weakness/heaviness; limb, neck, axial, general weakness	15	

Insights into use in clinical practice and research settings

- The psychometric performance of MG Symptoms PRO and the evidence generated to guide its interpretation suggest its potential usefulness in MG clinical trials for demonstrating treatment benefit on core symptoms of MG.[3]
- MG Symptoms PRO specifically assesses muscle weakness fatigability as well as physical fatigue.[1]
- The MG Symptoms PRO has potential for monitoring of symptom severity in a clinical practice setting due to a modular scale structure which allows assessment and interpretability of outcomes in a heterogenous condition such as MG.[1]

*Developed by UCB with patients. [†]The sum of responses to the items composing each scale undergo linear transformation to generate a score of 0–100[4]. [‡]Awaiting regulatory agencies feedback to assess whether its resulting evidence may support labelling claim. [§]Rating severity scale "none" to "severe". [‖]Rating frequency scale "none of the time" to "all of the time".[2]
MG, myasthenia gravis; PRO, patient-reported outcome.

1. Cleanthous S, et al. Orphanet J Rare Dis. 2021;16:457. 2. ClinicalTrials.gov. NCT03971422. Available at: https://clinicaltrials.gov/ct2/show/NCT03971422. Accessed April 2023. 3. Morel T, et al. Qual Life Res. 2022;31:S158. 4. UCB data on file. 2022. Patient-Reported Outcome Dossier. p13.

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Myasthenia Gravis Quality of Life 15-item Scale Revised (MG-QoL15r)

- The patient-reported MGQoL-15r scale is a revised and simplified version of the MGQoL-15 scale which was developed as an MG-specific QoL questionnaire, including assessments of physical, social, and psychological aspects of function across 15 items with 5 response options.[1–4]
- In order to improve interpretation in the clinical setting, the MGQoL-15r scale includes only 3 response options with statements relating to MG symptoms scored from 0 (not at all) to 2 (very much); a higher score is indicative of a poorer QoL.[3,4]
- No recall time is specified.[4]

MGQoL-15r[4]

	Not at all 0	Somewhat 1	Very much 2
I am frustrated by my MG			
I have trouble with my eyes because of my MG (e.g., double vision)			
I have trouble eating because of my MG			
I have limited social activity because of my MG			
My MG limits my ability to enjoy hobbies and fun activities			
I have trouble meeting the needs of my family because of my MG			
I have to make plans around my MG			
I am bothered by limitations in performing my work (include work at home) because of my MG			
I have difficulty speaking due to MG			
I have lost some personal independence because of my MG (e.g. driving, shopping, running errands)			
I am depressed about my MG			
I have trouble walking due to my MG			
I have trouble getting around public places because of my MG			
I feel overwhelmed by my MG			
I have trouble performing my personal grooming needs due to MG			

Insights into use in clinical practice and research settings

- MGQoL-15r is quick to administer and easy to interpret; the questionnaire has been demonstrated to have good reliability and longitudinal validity.[5] Patient fatigue is not assessed.[4]
- Used globally, both in clinical practice and trials, the revised version (MGQoL-15r) performs slightly better than the original and is now recommended because of its slightly improved psychometric properties.[4,6]

Adapted from Burns TM, et al. 2016

ADL, activities of daily living; MG, myasthenia gravis; MG-QoL15r, MG QoL 15-item scale revised; QoL, quality of life.

1. Burns TM, et al. Muscle Nerve. 2010;41:219–26. 2. Mullins LL, et al. Muscle Nerve. 2008;38:947–56. 3. Burns TM, et al. Muscle Nerve. 2008;38:957–63. 4. Burns TM, et al. Muscle Nerve. 2016;54:1015–22. 5. Diez Porras L, et al. J Clin Med. 2022;11:2189. 6. Barnett C, et al. Neurol Clin. 2018;36:339–53.

Quality of Life in Neurological Disorders Fatigue short form (Neuro-QoL-Fatigue-SF)

- Neuro-QoL-Fatigue-SF is a component of the Neuro-QoL standardized tool with a range of outcome measures designed to assess different aspects of QoL relevant to people living with neurological conditions.[1,2]
- It consists of 8 fatigue-related patient-reported items and has a 7-day recall period.[2]
- Total raw scores are calculated through summation of all 8 items and can range from 8 to 40, with higher scores indicating more fatigue.[2,3]
  - The adult fatigue item bank has excellent internal and test–retest reliability (stability through time).[2]

Neuro-QoL-Fatigue-SF[3]					
In the past 7 days	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
I felt exhausted					
I felt I had no energy					
I felt fatigued					
I was too tired to do my household chores					
I was too tired to leave the house					
I was frustrated by being too tired to do the things I wanted to do					
I felt tired					
I had to limit my social activity because I was too tired					

Adapted from National Institute of Neurological Disorders and Stroke. 2015[3]

Insights into use in clinical practice and research settings

- Neuro-QoL-Fatigue-SF possesses characteristics, such as brevity (a short measure which typically takes <2 minutes), flexibility in administration, and suitability for cross-disease comparisons that may be advantageous to users in a variety of settings.[1,2]
- Not developed specifically for MG but is instead applicable across neurologic conditions.[1,2]
- Neuro-QoL in general may be suitable for wide use, from clinical trial research to broader comparative effectiveness research, cross-sectional and longitudinal observational cohort studies, healthcare-delivery observational and intervention studies, and population-based research.[1]

ADL, activities of daily living; neuro-QoL, QoL in neurological disorders; QoL, quality of life.

1. Cella D, et al. Neurology. 2012;78:1860–67. 2. Tran C, et al. Muscle Nerve. 2018 ;58(2):197–203. 3. National Institute of Neurological Disorders and Stroke. User manual for the Quality of Life in Neurological Disorders (Neuro-QoL) measures, version 2.0. March 2015. http://www.healthmeasures.net/administrator/components/com_instruments/uploads/15-09-01_01-56-26_Neuro-QOLv1.0-FatigueSF_03-14-2014.pdf. Accessed Aug 2023.

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EuroQol 5-Dimension 5-Level (EQ-5D-5L)

- EQ-5D-5L is a patient-reported outcome tool to assess QoL.[1]
  - The EQ-5D-5L consists of the EQ-5D descriptive system and the EQ VAS, where patients rate their current health status on a scale from 0–100.[1]
  - EQ-5D-5L includes five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression.
  - Each dimension has five response categories with levels corresponding to no problems, slight problems, moderate problems, severe problems, and extreme problems/unable to function.
  - No recall time is specified.[1]
- EQ-5D-5L VAS is one component of the EQ-5D-5L tool, which contains a visual analogue scale providing a visual aid to support ease of grading label severity.[1]

EQ-5D descriptive system[1]

MOBILITY
- I have no problems in walking about
- I have slight problems in walking about
- I have moderate problems in walking about
- I have severe problems in walking about
- I am unable to walk about

SELF-CARE
- I have no problems washing or dressing myself
- I have slight problems washing or dressing myself
- I have moderate problems washing or dressing myself
- I have severe problems washing or dressing myself
- I am unable to wash or dress myself

USUAL ACTIVITIES (e.g., work, study, housework, family, or leisure activities)
- I have no problems doing my usual activities
- I have slight problems doing my usual activities
- I have moderate problems doing my usual activities
- I have severe problems doing my usual activities
- I am unable to do my usual activities

PAIN/DISCOMFORT
- I have no pain or discomfort
- I have slight pain or discomfort
- I have moderate pain or discomfort
- I have severe pain or discomfort
- I have extreme pain or discomfort

ANXIETY/DEPRESSION
- I am not anxious or depressed
- I am slightly anxious or depressed
- I am moderately anxious or depressed
- I am severely anxious or depressed
- I am extremely anxious or depressed

Insights into use in clinical practice and research settings

- EQ-5D is a generic instrument for describing and valuing health, based on a descriptive system.[1]
- EQ-5D-5L is a measure used in clinical trials[2,3] that has been widely tested, used in both general population and patient samples, and is available in over 150 languages and in various modes of administration.[1–4]
- It takes only a few minutes to complete and has been shown to be valid, reliable, and responsive across numerous diseases, but may be limited in the accurate reflection of clinically important changes (e.g., functional assessment staging).[2,5]
- EQ-5D-5L is not an MG-specific measure.[1]

EQ-5D-5L, EuroQol 5-dimension 5-level; QoL, quality of life; VAS, visual analogue scale.

1. Herdman M, et al. Qual Life Res. 2011;20:1727–36. 2. EuroQoL.org. About EQ-5D-5. Available at: https://euroqol.org/eq-5d-instruments/eq-5d-5l-about/. Accessed Aug 2023. 3. Feng YS et al. Qual Life Res. 2021;30:647–673. 4. EuroQoL.org. EQ-5D-5L Available modes of administration. Available at: https://euroqol.org/eq-5d-instruments/eq-5d-5l-available-modes-of-administration/ . Accessed Aug 2023. 5. Martin A, et al. Value Health. 2019;22:1417–26.

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