



## Galsgow Coma Scale Between Past Now and Future

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“A Wide range of conditions may be associated with coma or impaired consciousness, apart from acute brain damage due to traumatic, vascular, or infective lesions, there are embolic disorders such as hepatic renal failure, hypoglycaemia, or diabetic ketosis and also drug overdose” [1].

This is how Teasdale introduced his paper about Glasgow Coma Score and explained why we need this clinical scale. In 1974 the Glasgow institute was a world leader in brain injury research, Doctor Jennett and Mr Teasdale senior registrar published a paper in Lancet about Assessment of Coma and Consciousness they proposed a structured method of assessment named as Glasgow Coma Scale (GCS). 40 years on Graham led a project to understand it, its successes and its shortcomings.

Back in time and during World War II the Medical Research Council in Britain issued a glossary of psychological terms commonly used in cases of head injury named MRC glossary. Unfortunately these were not easily defined, which did show no evidence that the terms of the MRC glossary had been adopted [2].

Although there was existing systems before this scale and this was mentioned by Teasdale in his paper but from this time till now after a lot of multicentric clinical trials still it's the best reliable tool to unite our vision about management of patients.

The aim of this scale was is to use simple terms that could be readily understood by a wide range of observers, including doctors, nurses and medical caregivers. Repeated observations of the coma scale displayed on a bedside chart used to monitor the improvement or deterioration in conscious level as an indication of recovery or of complications and prognosis, use of sedation and ventilation can make assessment difficult but the motor score alone is still a good guide to severity.

According to Fischer and Mathieson GCS has been the gold standard in assessment of truma patients neurologically since it was inception [3]. As we know items of Gcs are 3 responses to assess in 15 points showed in Figure 1.

Eye Opening Response	
• Spontaneous – open with blinking at baseline	4
• To verbal stimuli, command, speech	3
• To pain only (not applied to face)	2
• No response	1
Verbal Response	
• Oriented	5
• Confused conversation, but able to answer questions	4
• Inappropriate words	3
• Incomprehensible speech	2
• No response	1
Motor Response	
• Obeys commands for movement	6
• Purposeful movement to painful stimulus	5
• Withdraws in response to pain	4
• Flexion: decorticate posturing	3
• Extension: decerebrate posturing	2
• No response	1
<b>Total</b>	

**Figure 1:** Glasgow Coma Scale.

So why they have chosen these 3 items to assess?

No clear answer for this but its mostly because it represents integration of brain circuits which are responsible for arousal, responsiveness and communications, a lot of studies done to assess performance of GCS as in Figure 2.

Motor response represents a big part of GCS its response details showed in Figure 3.

Reference	Test setting <sup>#</sup>	Patient type*	Health care providers		Main result*	Further results	Limitations
			Pre-hospital	Hospital			
[15]	Field, ED (n=3052)	Trauma	Paramedics	ED staff	GCS 3-13: moderate agreement; GCS 13-15: high agreement	Moderate agreement for GCS components	Time difference >20 min in 1/3, register data
[16]	Field, ED (n=12 882)	Major trauma	Paramedics	ED staff	Strong correlation		GCS categories (3, 4-8, 9-12, 13-14, 15), register data, missing values
[17]	Videotapes	ND	Paramedics	ED physician	Very strong agreement	Worsening GCS related to intubation, sedatives and paralytics	Limited description
[7]	Field, ED (n=7823)	Trauma	Paramedics	ED staff	Strong correlation 82% same GCS category		GCS categories (3-8, 9-13, 14-15), register data, missing values
[18]	Postal survey	ND	Pre-hospital physicians (n=102)	Senior physician (n=1)	Moderate accuracy, 63% same GCS	Moderate accuracy for GCS components	No field exposure
[19]	Field, ED (n=60)	TBI	Paramedics	ED physicians	Paramedics under-estimate GCS by 2 points	Correlation higher if age and alcohol/drug use are added	Only GCS 8-13 (no drugs, no intubation), mean time difference: 32 min, total GCS only
[20]	Classroom, videotapes	ND	Paramedics (n=41)	ED physicians (n=19)	GCS 14-15: excellent agreement, GCS 3-7: moderate agreement, GCS 9-13: low agreement	Moderate intra-rater agreement	No field exposure
[21]	Field and ED (n=33)	TBI, GCS < 8	Paramedics	ED staff	No relationship between GCS on scene and at hospital admission	Large difference between GCS on scene and hospital admission = better GOS at 2-3 months	Small study size Mean time difference: 21 min

\*As defined by original authors. <sup>#</sup>(Number of patients) if defined.  
 GCS: Glasgow Coma Scale, TBI: traumatic brain injury, ND: not defined, ED: emergency department.

Figure 2: Sample of studies performed on performance of GCS [4].

Level of response	Score	Details of response	Conditions		
			E	V	M
Obeying commands	6	The rater must rule out grasp reflex or postural adjustment			
Localising	5	Movement of limb as to attempt to remove the stimulus, the arm crosses midline, and moves to more than one site of noxious stimulus			
Normal flexor response/withdrawal	4	Rapid withdrawal and abduction of shoulder			
Abnormal flexor response	3	Adduction of upper extremities, flexion of arms, wrists and fingers, extension and internal rotation of lower extremities, plantar flexion of feet, and assumption of a hemiplegic or decorticate posture			
Extensor posturing	2	Adduction and hyperpronation of upper extremities, extension of legs, plantar flexion of feet, progress to opisthotonus (decerebration)			
None	1	The observer must rule out an inadequate stimulus or spinal transection			
			Ocular trauma	+	
			Cranial nerve injuries	+	
			Pain	+	+
			Intoxication (alcohol, drugs)		+
			Medications (anaesthetics, sedatives)		+
			Dementia		+
			Psychiatric diseases		+
			Developmental impairments		+
			No comprehension of spoken language		+
			Intubation, tracheostomy, laryngectomy		+
			Oedema of tongue		+
			Facial trauma		+
			Mutism		+
			Hearing impairments		+
			Injuries (spinal cord, peripheral nerves, extremities)		+

Figure 3: Motor response of GCS and conditions impair assessments [5].

There is some conditions that impair assessments included in the other part of Figure 3.

In 2010 Ana luisa compared a lot of comascales in its paper and concluded that:

The GCS is using simple parameters to allow less experienced doctors and other caregivers to do an accurate report of a patient's status of consciousness. Nevertheless, it has become a target of different criticisms a lot of studies have described its strengths and weaknesses [6]. Eye opening, is considered to indicate wakefulness, but eye opening does not mean that the content of consciousness is intact like a persistent vegetative state. In fact GCS does not provide a sufficient number of or suitable tools to cover the changes in consciousness. Moreover, it is limited to the diagnosis of coma but does not allow precise distinctions between the other states of consciousness [6].

Usefulness of inferring a prognosis of GCS is limited, especially in intermediate scores. Because it lacks precision, Moreover, we can't use GCS to assess changes of certain magnitudes in the state of consciousness [7].

In 2014 Joshua B. Brown., *et al.* searched for evidence base of GCs versus motor part of it and concluded that: GCSm score  $\leq 5$  increases specificity at the expense of sensitivity compared with GCS score  $\leq 13$ . When applied within the NTTP, there is no difference in discrimination between GCSm and GCS. GCSm score  $\leq 5$  is more strongly associated with TCN and better calibrated to predict TCN. Further study is warranted to explore replacing GCS score  $\leq 13$  with GCSm score  $\leq 5$  in the NTTP [8].

Although a lot of scales use GCS as main cornerstone for its evaluation but still a lot of criticism to this tool although it has been used for this long time but its still till now no reliable and simple tool as GCS is available to replace it so we need a lot of multicentre research to be directed to find us a reliable tool like GCS.

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