Glasgow Coma Scale

Glasgow Coma Scale (GCS) was introduced by Dr Teasdale and Dr. Jennett in 1974 to assess patients' level of consciousness. This tool is able to identify changes in patients' neurological condition promptly.

Consciousness consists of two components, arousal (wakefulness) and awareness (cognition). Arousal is controlled by the reticular activating system in the brain stem and awareness requires the normal function of higher cortical areas.

The GCS consist of three components, eye opening, verbal responses as well as motor responses.

<table>
<thead>
<tr>
<th>Category</th>
<th>Response</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Opening</td>
<td>Spontaneously</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>To speech</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>To pain</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td>Best Verbal Response</td>
<td>Orientated</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Confused (Disoriented)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Incomprehensive sounds</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td>Best Motor Response</td>
<td>Obey</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Localize</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Withdrawal</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Abnormal flexion</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Abnormal extension</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>1</td>
</tr>
</tbody>
</table>

Points are allocated for response in each component. The sum of these points indicates the severity of impairment in consciousness. The lowest GCS score is 3 and the highest score is 15. Severity of brain injuries can be classified according to the GCS scores.

- Severe brain injury - score of 3-8
- Moderate brain injury – score of 9-12
- Mild brain injury score of 13-15

Eye opening (E)

This component assessment a patient’s response to stimuli by opening his/her eyes. Eye opening indicates the arousal of the patient. There are 4 grades in this component.

4) Spontaneous eyes opening: patient opens his/her eyes without any external stimulation.
3) Opening eyes to speech: patient opens his/her eyes in responses to verbal stimuli.
2) Opening eyes to painful stimuli: patient opens his/her eyes only after painful stimulus was applied.
1) No eye opening: No eyes opening to verbal or pain stimuli.

Note
- If patient was sleeping and it requires verbal stimulation to wake the patient up and the patient is able to maintain eye opening during the whole assessment, this patient is scored as (4).
- If patient is sleeping and requires verbal stimulation to wake up and then drifted back into sleep or became drowsy and required frequent verbal stimulation to stay awake, then this patient is scored as (3).
- If patients are unable to open their eyes due to injury or edema, they are scored as (1). Nurses should explain in patients’ progress note why patients are unable to open their eyes.
- Patients with spontaneous eye opening may not indicate that the awareness component is intact. E.g. patients who are in permanent vegetation state have spontaneous eye opening but they are not aware of the surrounding environment and they are not focusing.
- Talk to patient on both ears to elicit a response to verbal stimuli (in case patient is deaf on one side).

Best verbal response (V)

This component is to assess the verbal response from the patient by asking three orientation questions. That is time, place, and person (names). There are five grades in this component.

5) Oriented: Patient is able to answer the current time, place, and person questions correctly. Some patients who answered all three questions correctly, however, during further conversation, the nurse may find the patient is not totally coherent. Since the patient is able to answer all three questions correctly; he/she is still scored as oriented or (5).
4) Confused (Disoriented): Patient is unable to answer one or more of the three orientation questions (time, place, and person) correctly. Some patients cannot answer all three orientation questions correctly but their conversation is coherent. They are still scored as (4). The more appropriate heading for this component should be “disoriented”.
3) Inappropriate words: Patient has random or exclamatory articulated speech and has no sustained conversational exchange.
2) Incomprehensive sound: Patient moaning (no words) and groaning with or without external stimulation.
1) No verbal response: Patient does not make any sound even when painful stimuli are applied.

Note:
- If patient has a tracheostomy, intubated, or aphasia, even if they can write or shake and nod his/her head for orientation questions correctly, he/she will
only score (1) because he/she has made no “verbal” responses. Nurses should explain in patient’s progress note how this patient response to the orientation questions.

- When asking the place, starts with country, province, city, and then building. Do not ask specific questions such as which bed he/she is in.
- Ask patient the current year and month or season. Do not ask the date or day of the week.¹⁰

**Best motor response (M)**
This component is testing patient’s best motor response to verbal or painful stimuli. Best motor response is least affected by trauma. This component in the GCS is the most accurate indicator in predicting patient’s outcome.¹² There are six grades in this component.

6) **Obey commands**: Patient is able to perform simple tasks as asked such as “show me your thumbs”, or “show me two fingers”. Do not ask patient to “grip my fingers”. These may be reflexes. For quadriplegic patients who are unable to move their limbs, nurses can ask patients to smile, stick out their tongue, or show their teeth.⁷

5) **Localized to pain**: Patient attempts to remove the source of painful stimuli by using his/her hand or tries to move his/her shoulder away from the painful stimuli.⁸

4) **Withdrawal to pain**: Patient tries to move his/her hand or foot when painful stimuli are applied to his/her fingers or toes.

3) **Abnormal flexion (decortication)**: when central pain is applied, patient will have elbows, wrists, and fingers flexion and drawn on top of the chest. Both arms are adducted and closed to the chest wall.

2) **Abnormal extension (decerebration)**: when central pain is applied, the patient will have strengthened elbow and internal rotation of shoulder and flexion of the wrist and fingers. Both arms are adducted and closed to the chest wall. Patient may have extension on his/her feet with plantar flexion.

1) **No response**: Patient does not demonstrate and limb movement when central pain is applied.

**Painful stimuli**

Painful stimuli can be classified into peripheral pain and central pain.

Peripheral pain is usually tested by applying pain to a patient’s fingers and toes. Responses to peripheral pain can be a spinal reflex.⁹ Do not apply pressure on the nail beds because it may damage the soft tissue under the nail.¹⁰,¹¹ Apply pressure with a pen placed on the lateral aspect of two fingers between the second and third phalangeal joints.⁹

Central painful stimuli are tested to assess the integrity of the higher centers of the brain such as brain stem and cerebral cortex. It should be applied to the core area that does not elicit a reflex such as squeeze on the trapezium muscle (cranial nerve XI) or pressure on the angle of the jaw (cranial nerve V).⁹,¹¹

Sternal rub is also classified as central painful stimulus; it should be avoided if possible. Repeated sternal rubs may leave bruises on patient’s sternal area. These bruises could be misinterpreted as battery or abuse to patient.⁵,¹²

**Important Notes**
- A deterioration of one point in the best motor response or an overall deterioration of 2 or more points in the GCS is clinical significant and must be reported immediately.¹³
- Patient’s level of consciousness can be affected by medications such as sedatives, hypnotics, paralytic agents, or alcohol.⁸,¹⁴

**Reference**

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