

from a supine to a recovery position. The standardized patient used in this study was represented by a 20-year-old male with a height of 185 cm and a weight of 87 kg, simulating a fully relaxed, unresponsive state. Throughout the experiment, only one person was used as a standardized patient. Participants were not provided any assistance from the standardized patient, ensuring that all actions taken were solely performed by the participant.

All participants who indicated unfamiliarity with the recovery position were provided with a brief theoretical overview, including its purpose and correct technique, and were shown an illustrative reference from the 2021 and 2025 European Resuscitation Council guidelines [5, 7] prior to beginning the practical experiment.

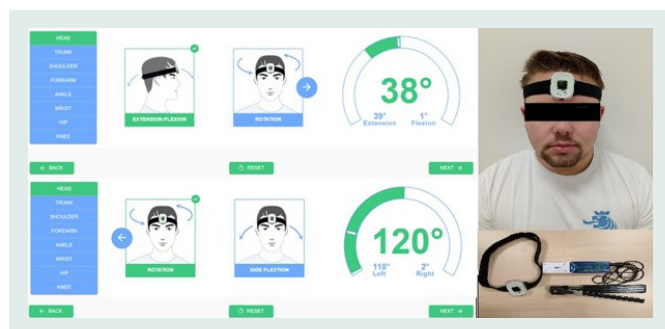
Based on subjective assessment prior to testing, study-specific exploratory reference ranges were derived from one standardized patient who reported adequate comfort and spontaneous breathing. If the patient began to feel restricted breathing, these values were rated as inadequate. The study-specific exploratory reference ranges were measured and determined at a head tilt of 20–40° and a rotation around the body axis of 90–110°.

Variables. The procedure evaluated specific body maneuvers, such as pelvis and shoulder grips, handling of the standardized patient's clothing, spinal rotation, and head tilt. Gyroscopic sensors (3D tutor, model 3DT100 by MediTouch Limited) monitored these actions, while the MediTutor system in the MediTouch application (version 10) recorded performance metrics. The sensors were positioned strategically: one on the standardized patient's forehead (centered between the eyebrows) to track overall body rotation, and another on the back of the head to capture both head rotation and tilt. A certified electronic goniometer (PS-2137) manufactured by PASCO and the PASPORT Angle Sensor PS-2139 with SPARKvue software (version 1.8) provided secondary head tilt measurements by placement on the standardized patient at the level of the seventh cervical vertebra (vertebra prominens).

The gyroscopic sensors provided precise measurements of the head and cervical spine angles, capturing both rotation and tilt during positioning. The procedure itself was performed under the supervision of an experienced paramedic. No objective assessment of airway patency, secretion drainage, or ventilation parameters was performed.

Statistical Analysis. Descriptive statistics were used to summarize the data. The results are presented as absolute numbers (n) and percentages (%).

Fig. 1. Gyroscope placement and motion evaluation



Language Editing. Following the completion of the manuscript, ChatGPT-4.0 was utilized for language refinement. The authors have reviewed all AI-assisted modifications and are fully accountable for the content presented in the final published article.

Results

Practical Performance and Observations

Participants were tasked with moving a standardized patient from a supine to a recovery position. The critical elements evaluated included gripping technique, spinal alignment during rotation, and head tilt.

Grip Techniques

Controlled rotation was achieved by 445 participants (89%) using correct shoulder and knee grips. Conversely, 11% used suboptimal grips, such as the wrist, arm, or waist. A correct knee grip from the outside of the knee joint was achieved by 430 participants (86%), while the rest used less effective grip points, such as the thigh, calf, or ankle.

Spinal Rotation

Spinal rotation was evaluated to assess alignment and segmental twisting during the maneuver. A total of 170 (34%) participants showed asymmetrical rotation associated with the coordination of shoulder and knee pulls.

Head Tilt Analysis

Gyroscopic sensors and an electronic goniometer identified a study-specific exploratory observed head tilt range of 20°–40° based on subjective comfort assessment:

- 10°–20° tilt: 130 participants (26%);
- 20°–30° tilt: 226 participants (45.2%) — study-specific exploratory reference range;
- 30°–40° tilt: 121 participants (24.2%) — study-specific exploratory reference range;
- 40°–52° tilt: 23 participants (4.6%).

When the angle was set at 20°–40°, the standardized patient reported the greatest subjective comfort during spontaneous breathing.

For the standardized patient, head positions at angles less than 20° and greater than 40° were associated with subjective discomfort and perceived breathing restriction.

Spinal Rotation and Head Tilt Relationship

The study-specific exploratory rotation range derived from one standardized patient was determined to be between 90–110°; within this range, the standardized patient reported subjective comfort. This range was achieved by 309 participants (61.8%).

Figure 2 illustrates the relationship between the angles of spinal rotation and head tilt.