Authors:
Mdm. Maharita Ab Rahman
Dr. Izzuna Mudla Mohamed Ghazali

External Reviewer:
Dr. Akmal Haficah Ramli
Consultant Rehabilitation Physician, MOH

Mdm. Tan Foo Lan
Occupational Therapist, MOH

For further information, please contact:

Malaysian Health Technology Assessment Section (MaHTAS)
Medical Development Division
Ministry of Health Malaysia
Level 4, Block E1, Precinct 1
Government Office Complex
62590 Putrajaya.

htamalaysia@moh.gov.my
Tel: 603 8883 1229

Available at the following website:
http://www.moh.gov.my

2021

Background

Driving is a complex activity that requires intact cognitive, behavioural, and motor function. Driving also represents an important activity of daily living as it enables community reintegration, independence and engagement in social, vocational and leisure pursuits. Driving test or driving assessment among people with history of illnesses that altered the cognitive or motor function might be difficult with on-road assessment. However, currently there is a driving simulation technology that able to provide driving test or assessment in safe environment. The simulation technology provides safe, objective and repeatable performance measures pertaining to operational or tactical driver behaviours.

The driving simulator has the potential to serve as a re-training tool that can be designed to provide experiences that apply and challenge specific motor, cognitive, and perceptual skills within a safe, non-confronting and contextual driving environment. The technology of driving simulators evolved over the past decade to make driving simulator systems more appropriate and available for widespread use in clinical settings. Many occupational therapy researchers and other professionals used driving simulators to test a variety of applications across drivers. Some examples include: Alzheimer's, traumatic brain injury, post-traumatic stress disorders, epilepsy, hemianopia, Parkinson's Disease, stroke, attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder. In Malaysia rehabilitation practice - common medical impairments referred for pre-driving assessment are neuro-medical condition such as stroke; musculoskeletal condition such as congenital or acquired limb defects, orthopaedic deformities; neurological condition such as foot drop, spinal cord injury; and neurosurgical cases such as acquired brain injury.

This technology review was requested by an Occupational Therapist, Hospital Tengku Ampuan Afzan (HTAA), Ministry of Health Malaysia in order to expand its usage in Ministry of Health facilities.

Objective

The objective of this technology review was to assess the efficacy/effectiveness, safety and cost-effectiveness of driving simulator for vehicle driving among patients with/recover from various health conditions such as stroke patients, brain injuries and visual impairment.

Methods

Literature search was conducted by an *Information Specialist* who searched for published articles on driving simulator. The following electronic databases were searched through the Ovid interface: Ovid MEDLINE® In-Process & Other Non-Indexed Citations and Ovid MEDLINE® 1946 to September 2021. Parallel searches were run in PubMed, US FDA and INAHTA database. No limits were applied to the search. Additional articles were identified from reviewing the references of retrieved articles. The last search was performed on 23rd September 2021.

Results and conclusion:

Based on the review, the outcomes of the driving simulator varied depending on types of illnesses, driving simulators specifications, and driving environments.

The retrievable evidence showed that, the driving simulator able to assess the capabilities of the patients in controlling their physical/sensory skills, and cognitive-perceptual while taking turn, break or handling any emergency reactions while driving. It enables the assessor to determine whether the patients can return to drive or not. The driving simulator allowed the patients to practise various driving skills, re-familiarize themselves with the task of driving and prepare for return to on-road driving within a safe environment.

In terms of safety, simulator sickness occurred such as headaches, heaviness in the head, eye-strain and difficulty focusing and dizziness/vertigo due to sharp movements of the screen, increases in environmental stimuli and going around corners. Others were fatigue, nausea, general discomfort and upper limbs soreness due to prolong used of the steering wheels.

There was no study on cost-effectiveness of driving simulator retrieved, however, the price for the driving simulator machine was varied depends on types, brands and specifications.