LETTERS TO THE EDITOR

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Virtual-reality rehabilitation for inpatient elderly leukemic patients: psychological and physical roles during the fourth **COVID-19** wave

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Dear editor.

Cancer diagnosis and rehabilitation may be a frightening and stressful experience for patients. Although survival statistics from those diagnosed with cancer are greater than ever before, cancer treatment (including chemotherapy, surgery and radiotherapy) is still an extremely traumatic experience in a patient's life. Patients with cancer may not only be at risk of negative medical consequences, but their psychological well-being may also be adversely impacted as a result of the illness and its treatment [1].

Aside from the fact that half of haematological cancer patients are older than seventy years of age at actual diagnosis [2], the most common hematopoietic stem cell disease for those between 60-65 years of age is chronic myeloid leukemia [3], and other common leukemic cancers (non-Hodgkin lymphoma, multiple myeloma, chronic lymphocytic leukemia and acute myeloid leukemia) [2] can cause a significant substantial deconditioning related to the disease itself, along with medical consequences or therapeutic modalities. For example, cachexia, nausea, tiredness, anaemia (frequently experienced by chemotherapy patients), myopathy (induced by steroids or critical care) and peripheral neuropathy (induced by chemotherapy or critical care) are common typical side effects of leukemia treatment [4].

Aside from the gained improvement of cognitive, physical, psychological health aspects in many chronic diseases [5], inpatient rehabilitation or exercise for leukemic patients is urgently needed due to many causes, including: 1) good functional status may increase the survival rates, 2) dependence of treatment eligibility on the functional status of the patient, 3) positive rehabilitation impacts on quality of life, 4) rapid discharge from hospital [4].

With the end of the third wave of COVID-19, some countries in Asia are in the midst of a fourth COVID-19 wave [6], which will reach other countries in the Middle East - including Egypt - in the winter of 2021.

The winter season itself represents a great a powerful opportunity for COVID-19 transmission between individuals [7]. Despite extraordinary social distancing measures and vaccine research efforts, COVID-19 continues to place a significant load on healthcare workers and residents of inpatient facilities [8].

Long-term care treatments, including face-to-face rehabilitation, have also been discontinued [9] or avoided to reduce the risk of infection for both healthcare workers and patients. It is no longer possible to give the same level of rehabilitation for the elderly in inpatient institutions as it was before the COVID-19 epidemic [10]. With a fifth and sixth wave of COVID-19 on the horizon, all governments and public health agencies will need to stay open to innovative approaches for combating the epidemic and its repercussions on the health sector [6].

Virtual reality (VR) has emerged as a viable therapeutic and rehabilitation tool in a variety of geriatric medical field to combat chronic illnesses and impairments associated with advancing age [11]. The VR scenario is a computer-developed scenario (a virtual world) in which the patient may interact in three dimensions and feel as if he or she is a part of the scene [12].

When it comes to exercising to combat physical inactivity and sedentary lives, poor motivation is a common problem. In the context of rehabilitative therapies, results and recovery are frequently dependent upon the patient's desire, resulting in inadequate adherence. This has been highlighted as a problem in several fields of geriatric rehabilitation [13].

The incorporation of VR into exercise equipment creates visually exciting workout experiences, which has led to increased impacts on one's inner and extrinsic incentives for motivation to exercise, increased self-efficacy and mood, as well as increased exercise adherence and enhanced health [14].

VR is also a potential technique for cognitive diversion and psychological rehabilitation support for cancer patients. VR has been utilised in oncology to reduce discomfort levels or gamify the experience of pain distraction during chemotherapy infusions, unpleasant oncological treatment procedures and while patients feel bored after treatment processes when they are hospitalised [15, 16].

Exergames, a type of VR-based exercise, maybe an excellent way to promote physical activity, since they are more enjoyable. Video games encourage (either by utilising or forcing) older players with cancer to engage in physical activity that is typically more than sedentary and includes exercises that improve strength, balance and flexibility.

Incorporating integrative (complementary) therapies into main first-line therapeutic approaches is highly recommended for many diseases, including cancer in the elderly. VR-based exercise, as an integrative or complementary therapy, is considered an easy, available, low-risk to cross-infection, self-training, safe and low-cost alternative to face-to-face inpatient rehabilitation for leukemic elderly during repeated waves of COVID-19.

The availability of VR-based exercise techniques in inpatient elderly cancer facilities can compensate for the shortage of rehabilitation therapists, decrease the number of face-toface rehabilitation sessions during COVID-19 waves, increase the adherence of those with low immunity to exercise, improve motivation during chemotherapy or radiotherapy, improve pain tolerance rates resulting from the disease or its treatment, enhance the functional and physical status and improve the survival rates of elderly leukemic patients.

As always, despite the above-mentioned advantages, the VR-based exercise technique has many limitations. Absence of inclusion criteria of cancer patients, as well as the need for continuous monitoring to guarantee patients' safety, availability of internet source and good internet speed (to guarantee smooth playback of programs), elderly' difficulties in dealing with new technologies are some recognized/faced main limitations needed to be addressed during VR-based exercise.

There are many suggested solutions to the above-mentioned limitations. Firstly, including the most medically stable leukemic elderly in VR-based exercise programs must be conducted under the supervision of attending oncologist. Secondly,

in a healthcare service-based settings (e.g. hospital or clinic), physical and/or occupational therapists (with co-operated counselling with the treating oncologist) must monitor, care for and supervise the patients during the VR-based exercise session to monitor for signs of cardiovascular, respiratory or neuromuscular exhaustion that may appear in patients during exercise. Thirdly, a VR technician must be present during the exercise session to solve any problem that occurs in the VR settings. Fourthly, the infrastructure of the healthcare service-based settings must be equipped with unlimited speed Internet to prevent any exercise session disruption due to Internet outages and to guarantee smooth playback of programs. Fifthly, under the supervision of the physiotherapy team of the hospital, courses should be conducted in the form of group therapy to explain the VR components, method of operation, skills and basic training before incorporating them into the scheduled VR-based exercise programmes for elderly cancer patients.

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