ABSTRACT

This thesis aims to design and develop a mechanical bed prototype equipped with an automatic and manual positioning system. This tool is designed to assist patients in the healing process by allowing adjustment of the position of the bed according to their medical needs.

The background of the problem is that medical devices, especially patient beds, have an important role in supporting patient healing and care. Certain sleeping positions have been shown to be beneficial for speeding recovery, reducing pressure on certain organs, and improving blood circulation. However, in conventional beds, positioning is still done manually by humans, which can limit the efficiency and flexibility of the device.

In this study, a national health survey was conducted to identify patient needs in the use of mechanical beds. The results show that the use of a mechanical bed can improve the patient's healing process by adjusting the sleeping position according to medical needs. Previous studies have also shown that mechanical beds that feature automatic positioning provide significant benefits for patients with cardiopulmonary conditions and hypovolemic shock.

In order to achieve the research objectives, a prototype design of a mechatronic-based mechanical bed was carried out using a microcontroller. This prototype can set and update up to 12 shape positions that can be changed according to the user's wishes. This position setting can be done via the remote control provided. In addition, this bed also allows manual adjustment to a more comfortable position for the patient.

Market reviews show that this tool can be used in hospitals, health institutions, or by individual users with medium to high economic means. Making this *mechanical bed* considers manufacturability and sustainability aspects. Although production costs are slightly higher than conventional beds, the innovative features of these beds are expected to provide significant benefits to patients and increase efficiency in the healing process.

In order to meet product specifications, this prototipe is designed to have an actuator that is able to withstand the maximum weight of a normal human and a detecting angle on the third-

level frame to adjust the angles of the upper body, upper legs, and lower legs.

The results of this study, the patient's bed can move according to the preset that has been set and can be moved manually. This patient bed has a remote that can adjust movement automatically and manually. The resulting angle is more accurate than conventional patient beds.

Keywords: bed, mechatronics, sensors, actuators, controllers