

Development of Methods to pressure Map the Patient Device Interface in Support Surface

Pressure ulcers have been stated as a significant issue in every medical department. This issue has affected patients for a long period of time and addressing its overall management is currently as an obvious international healthcare issue. Pressure ulcer commonly known as bedsores, decubitus ulcers or pressure sores are a very serious healthcare problem. Despite advances and current interest in medicine, pressure ulcers stay a main cause of mortality and morbidity. This problem is skin lesions are possibly caused by multiple factors such as humidity, friction, shearing forces, medication, temperature, age, continence and unrelieved pressure. This can happen for wheelchair users in the buttock area or hospitalised people in the sacrum and heel skin due to loading on the soft skin that probably damages the tissue. Pressure ulcers can affect any areas of the body, for example, cartilaginous or bony areas, but the most usually affected parts are sacrum, ankles, knees and elbows. Furthermore, this development might occur to any tissue that is under pressure, and the therapy could exist beneath medical devices. The pressure has been considered as the most essential extrinsic factor for developing ulcers including friction and shear. Pressure ulcers occur due to a combination of pressure, friction and shear acting on an area of the body. This combination will then generate a greater amount of pressure inside the tissue than any other factors. This develops because of prolonged sitting that expose the patient to extreme danger of decubitus ulcers. Friction and shear are forces that contribute mechanically to the formation of pressure ulcers. These forces are two separate phenomenon's that result in the tissue injury, which can be like a superficial skin mark, but also can be compromise of tissue right through to the bone. Friction and shear occur together to develop ulcers and produce tissue ischemia. Shear force acts on the part of the body in a parallel direction to the surface of the body. This shear can be affected by the friction coefficient between the materials that contact each other. The range in which the skin creates contact with the support surface also influences shear. Friction and shear act hand in hand, however one exists rarely without the other. Shear injury is possibly invisible at the body due to its appearance beneath the skin while friction injury can be seen because of the dragged skin across a rough surface. This pressure impacts negatively on the blood supply, damages the tissue and may causes death. Therefore, the blood needs oxygen and other nutrients for keeping tissue healthy because the tissue can be damaged if there is no a constant blood supply. In addition, when the ulcer develops, bacteria can infect it since the skin does not get infection-fighting white blood cells due to the lack of blood flow. The injury mechanism is that the movement of the underlying skin layers with the patient when the dermal layers are adhered to chair surface or bed due to friction; occurring tissues shear under the skin. Friction may create the injury; however, the resultant harm is shear to the tissue layers. In this case it is present nonetheless although it is rarely to notice friction versus the skin till it occurs an injury. For instance, study the variation between wearing a stretchy smooth material against a close fitting garment. Most people would choose the first however might not notice they are avoiding friction. Also when people have a better sleep due to sleeping on a surface that contains high-thread-count lines, this could be because of the lack of friction. These types of friction would seem unreasonable to pressure ulcers and wound care, but consider people who are hospitalized and less often choose the surfaces or bed they are on for may be very long time.

The project aims to provide a systematic knowledge of the significant concepts, methods for effective management for engineering and technical field. It aims to produce coherent and detailed understanding for the practical and theoretical principles of pressure ulcers development. Furthermore, this will demonstrate critical professional standards awareness, relevant conduct codes, and sustainability and system safety. The project additionally aims to develop a methodology for investigating the risk of pressure ulcers using Tekscan pressure mapping systems, 3D surface analysis and characterisation and computational modelling to provide a tool for evaluation of the skin/device interface. This is needed to provide a tool for evaluating pressure redistribution devices, which are widely used in clinical situations without complete evidence to their performance. The Friction/shear mechanism will be clearly investigated. Pressure, friction and shear relationships will be carefully analysed. Finite element analysis also will be carried out for tool and material investigation, selection, simulation and validation.