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A PROACTIVE SYSTEM TO PREVENT PRESSURE ULCERS VIA HOSPITALISATION

Dr. B. Sivasankari [1], S. Sathish [2], Sasikumar. S [3], Mohit. S [4], Santhosh Kumar. R [5]

[01] UG Scholar, B. E. Electronics and Communication Engineering

[01] SNS College of Technology

ABSTRACT: - *The main objective of this paper is to prevent HAPU – Hospital acquired pressure ulcers. In India Pressure Sores prevalence in hospitalised patients varies from 4.94 to 7.8% at diverse tertiary health-care facilities, ranking it one of the most neglected health care delivery issues in India. A significant issue that affects one in twenty people who are admitted to the hospital with a sudden illness is hospital acquired pressure ulcers (HAPUs). Patients who have restricted movement and are unable to independently change positions in bed frequently get these ulcers. By shifting the patient every two hours to alternate between the lateral and supine positions and by employing pressure-redistributing mattresses, HAPUs have historically been kept to a minimum. Due to low caregiver compliance with turning guidelines, such a patient repositioning timetable is frequently not maintained in healthcare facilities. The likelihood of HAPUs is increased by challenges in continuously monitoring patient position, a lack of turn reminders and alerts, and an inadequate caregiver staffing ratio. The demand for better pressure ulcer prevention is addressed through a unique technique. The suggested system uses a wearable gadget to continuously track the patient's location and wireless communication with a tablet to notify the caregiver when a patient turn is approaching in accordance with the hospital's policy. The hospital's cloud technology allows for centralized monitoring by recording and updating the turning operation as well as the patient's position, which is continuously tracked. In a controlled environment, the system was able to continually track the posture of the patient and can precisely identify typical patient poses.*

Keywords: Pressure Sores, Pressure Ulcers, Repositioning, Prevention

1. Introduction: -

A pressure ulcer is described as "an area of localized injury to the skin and underlying tissue produced by pressure, shear, friction and or a combination of these" It is also referred to as a pressure sore, decubitus ulcer, or a bedsore. Insufficient blood flow to the skin and underlying tissues as a result of applied pressure results in tissue ischemia and has an impact on cellular metabolism. Pressure ulcer risk may be higher in elderly people with reduced mobility, impaired mental capacity, and increased skin friction and shear. In hospitals, a sizable minority of patients suffer from pressure ulcers.

According to a Swiss study, 10% of acute hospitals had pressure ulcers (Stage 1 or greater). 41% of the patients at a 252-bed geriatric unit in Glasgow were found to have some form of pressure injury. A certain tactics used to prevent pressure ulcers, including repositioning the patient or using pressure-relieving pillows or mattresses to reduce the duration or magnitude of the pressure at the skin's surface, as well as intrinsic factors like the patient's skin's ability to resist damage and remain intact.

It also enhances the nutrition, circulation, and hydration, pressure injury can be reduced. According to some data, malnutrition is positively connected with the frequency and severity of pressure ulcers. Reduced calorie intake, dehydration, and a decline in serum albumin may make skin and underlying tissue less resistant to pressure, friction, and shearing force, which raises the risk of skin disintegration and slows the healing of wounds. PUs is linked to poor health outcomes, elevated treatment costs as well as future court judgments. Thus, Repositioning schedules and the use of suitable support surfaces are the key PU preventive strategies. The standard procedure in Hospitals used to be to rotate patients every two hours by caregivers and nurses. Over the decades, The Patients who are in the state of Prolonged Loss of Consciousness doesn't move their Positions As a result, a nurse/caregiver has 2-hourly schedule proposed to rotate their Positions. However, the System is to facilitate the patients to efficiently get rid of the pressure sores. The Project continuously monitors the Patient's Sensory Perception, Moisture, Activity, Mobility, Nutrition, Friction and Shear.

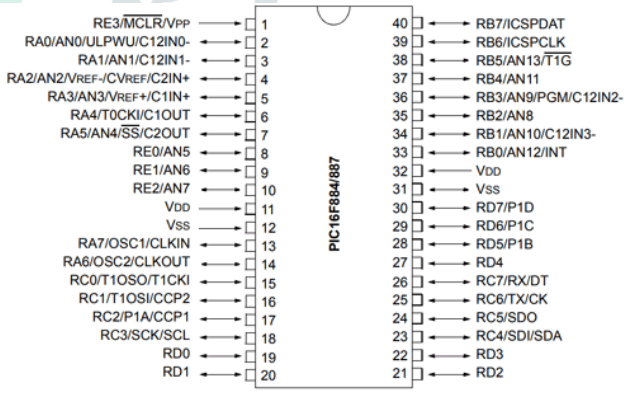
2. EXISTING TECHNIQUE: -

This existing technique proposes a system in which the patient's position is changed every 2 hours to alternating lateral and supine positions by the caregiver and a manual log of the changed position is recorded. In ICUs and hospital wards such a turning procedure is not always followed strictly because of a low caregiver compliance to turning protocols. So, Difficulty in continuously monitoring patient position, lack of a system which can provide turn reminders/alerts and suboptimal caregiver staffing ratio increases the occurrence of Pressure Sores.

3. SYSTEM HARDWARE: -

3.1.16F887 MICROCONTROLLER: -

The PIC16F887 is an 8-bit microcontroller from Microchip. The 40-pin IC has 14 Channel 10-bit ADC making it suitable for applications which require more ADC inputs. The IC also has 2 Comparators, 2 Timers (8-bit and 16-bit) and supports SPI, I2C and UART communication protocols. The IC also supports safety features like Power-on Reset (POR), Brown-out Reset (BOR), Low Current Watchdog Timer (WDT) etc. making it suitable for task critical and industrial applications. The controller supports In Circuit Serial Programming (ICSP) allowing the designer to program the controller easily even without removing it from the actual circuit. In order to program the PIC microcontroller, we will need an IDE (Integrated Development Environment), where the programming takes place. A compiler, where our program gets converted into MCU readable form called HEX files. An IPE (Integrated Programming Environment), which is used to dump our hex file into our PIC MCUS. They can be downloaded directly from their official page. To dump or upload our code into PIC, we will need a device called PICkit 3. The PICkit 3 programmer/debugger is a simple, low-cost in-circuit debugger that is controlled by a PC running MPLAB IDE (v8.20 or greater) software on a Windows platform. The PICkit 3 programmer/debugger is an integral part of the development engineer's tool suite. In addition to this we will also need other hardware like Perf board or breadboard, Soldering station, PIC ICs, Crystal oscillators, capacitors etc.



3.2. BRIDGE RECTIFIER: -

The bridge rectifier is a type of full-wave rectifier that uses four or more diodes in a bridge circuit configuration to convert alternating (AC) current to a direct (DC) current. A single diode can transform AC power into an

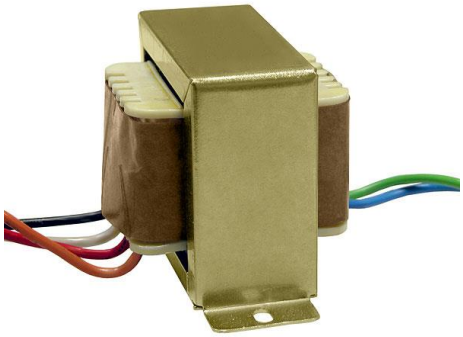
intermittent DC flow, but a bridge rectifier uses four diodes to reverse the direction of both sides of the AC pulse. With a bridge rectifier, the DC still oscillates from zero to a peak value, but it doesn't cut out half the time.

3.3. LIQUID CRYSTAL DISPLAY: -

This is an LCD Display designed for E-blocks. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multi programmer or a 5V fixed regulated power supply. The 16 x 2 intelligent alphanumeric dot matrix displays are capable of displaying 224 different characters and symbols. A full list of the characters and symbols is printed on pages 7/8 (note these symbols can vary between brand of LCD used). This booklet provides all the technical specifications for connecting the unit, which requires a single power supply (+5V). Here the LCD is used to display the vitals of the Patients Mobility, Sensory Perception, Moisture, Activity, Nutrition, Friction and Shear

3.4. STEP DOWN TRANSFORMER: -

Step-down transformers are used to decrease the voltage incoming to the site by increasing the electrical current. It does this by converting the high incoming voltage in the primary winding to the necessary lower voltage in the secondary windings. Usually, step-down transformers are used in electricity distribution networks to change the voltage output from a power station to that needed for high voltage transmission and back down again for use in homes, factories and offices. Here the step-down transformer is used to reduce the high voltage to low voltage and increase the electrical current.

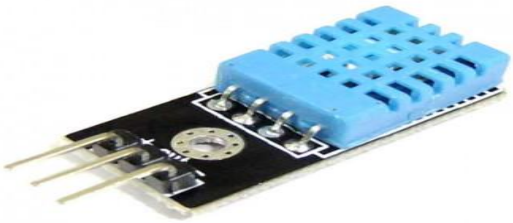


3.5. RELAY: -

A relay is an electrically operated switch. They commonly use an electromagnet (coil) to operate their internal mechanical switching mechanism (contacts). When a relay contact is open, this will switch power ON for a circuit when the coil is activated. Relays allow a low current circuit to control one or more higher current circuits. Thinner cables can be used to connect the control switch to the relay thereby saving weight, space and cost. Relays allow power to be routed to a device over the shortest distance, thereby reducing voltage loss. Heavy gauge cable only needs to be used to connect a power source (via the relay) to the device. Here we use relay to switch up the motors which is placed inside the bed. Once after the vitals like Patients Mobility, Sensory Perception, Moisture, Activity, Nutrition, Friction and Shear are fetched. It automatically tends to switch the motor after 15 mins once.

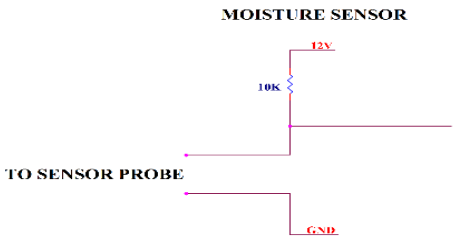
3.6. TEMPERATURE SENSOR: -

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. Here we use temperature sensor to reduce the Shear and Friction in the patients.



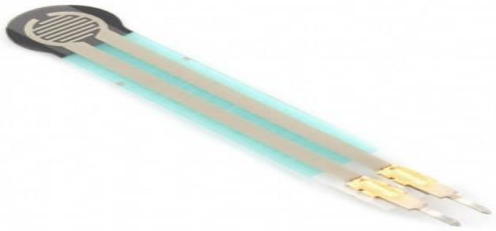
3.7. BODY MOISTURE SENSOR: -

Body Moisture Sensor measure the volumetric water content indirectly by using some other property of the BODY, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and BODY moisture must be calibrated and may vary depending on environmental factors such as BODY type, temperature, or electric conductivity. BODY moisture sensors typically refer to sensors that estimate volumetric water content.



3.7. FORCE SENSOR: -

Force sensor is a type of transducer, specifically a force transducer. It converts an input mechanical force such as load, weight, tension, compression or pressure into another physical variable, in this case, into an electrical output signal that can be measured, converted and standardized.



3.8 KEYPAD: -

A group of keys in a single printed circuit board is call key pad. And these keypads are used to track the patient's mobility and activity. So we can monitor the patients position to repositioning after some time

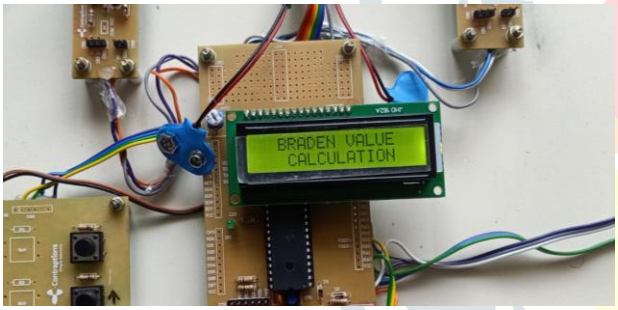
4.WORKING OF PROPOSED METHOD: -

The Designed system will continuously monitor the Patients position. It calculates the Patient's Sensory Perception, Moisture, Activity, Mobility, Nutrition, Friction and Shear. First it keeps track of Sensory Perception in this parameter It evaluates a patient's capacity to recognize and react to discomfort or pain brought on by pressure on certain body areas. This category includes the capacity for pain perception itself as well as a patient's level of consciousness and, consequently, their capacity

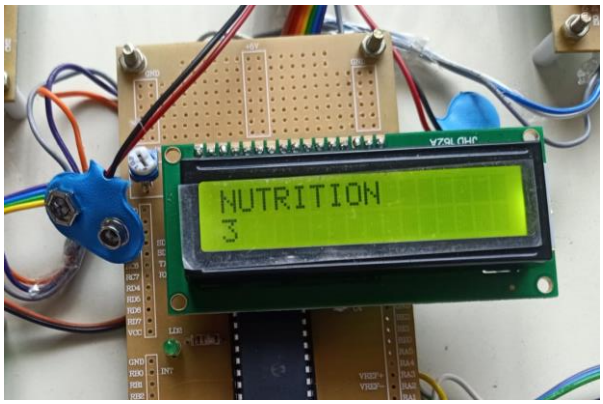
for a cognitive response to pressure-related discomfort. Additionally, it measures and records by causing the skin tissue to become macerated and putting the epidermis at danger for erosion, excessive and ongoing skin moisture can put the integrity of the skin at risk. Activity reveals the patient's degree of physical activity because inactivity can promote tissue breakdown and muscular atrophy. Mobility refers to a to a patient's capacity to change their body position on their own. This evaluates the client's willingness to move as well as their physical ability to move. A client's nutritional status is evaluated by looking at their typical daily eating habits. One sign of a greater risk in this group is eating only small amounts of meals or having an unbalanced diet.

5. RESULT: -

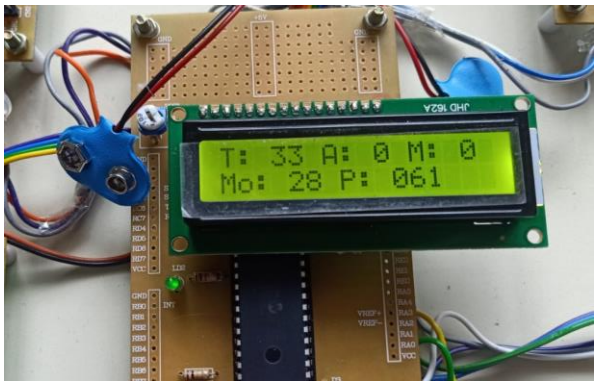
The results can be displayed in the LCD. First it displays the **Braden Scale for Predicting Pressure Ulcer Risk.**



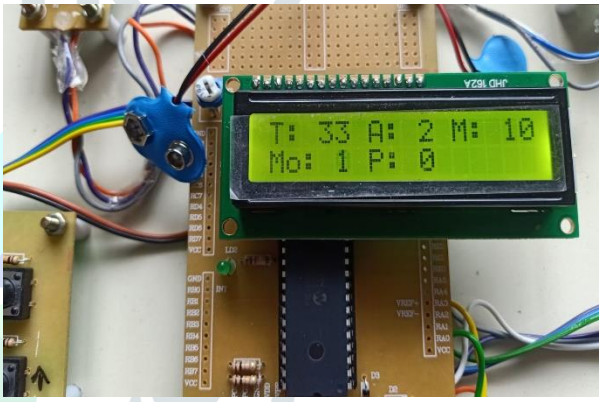
This Braden Value Calculation shows the Sensory Perception, Moisture, Activity, Mobility, Nutrition, Friction and Shear.



The above figure shows the Nutritional Status at their normal pattern of their daily nutrition of the patient.



The above figure shows the Temperature, Moisture and Pressure of the Patients position in bed.



The above figure shows the Activity and Mobility of the Patient in the bed

6. CONCLUSION: -

By using this method, we can prevent and monitor the pressure sores. By using this method, we can prevent and monitor the Sensory Perception, Moisture, Activity, Mobility, Nutrition, Friction and Shear. So, by means of this the bed tends to automatically inflates inside it. So that the patients who are unable to change position themselves.

7. REFERENCES: -

1) Levine JM. Historical perspective on pressure ulcers: the decubitus ominosus of Jean-Martin Charcot. J Am Geriatr Soc. 2005 Jul;53(7):1248-51. [PubMed]

2) Anders J, Heinemann A, Leffmann C, Leutenegger M, Pröfener F, von Renteln-Kruse W. Decubitus ulcers: pathophysiology and primary prevention. Dtsch Arztebl Int. 2010 May;107(21):371-81; quiz 382. [PMC free article] [PubMed]

3) Bansal C, Scott R, Stewart D, Cockerell CJ. Decubitus ulcers: a review of the literature. Int J Dermatol. 2005 Oct;44(10):805-10. [PubMed]

4) van Marum RJ, Meijer JH, Ribbe MW. The relationship between pressure ulcers and skin blood flow response after a local cold provocation. Arch Phys Med Rehabil. 2002 Jan;83(1):40-3. [PubMed]

5) Leblebici B, Turhan N, Adam M, Akman MN. Clinical and epidemiologic evaluation of pressure ulcers in patients at a university hospital in Turkey. J Wound Ostomy Continence Nurs. 2007 Jul-Aug;34(4):407-11. [PubMed]

6) Gefen A. Reswick and Rogers pressure-time curve for pressure ulcer risk. Part 1. Nurs Stand. 2009 Jul 15-21;23(45):64, 66, 68 passim. [PubMed]

7) Witkowski JA, Parish LC. Histopathology of the decubitus ulcer. J Am Acad Dermatol. 1982 Jun;6(6):1014-21. [PubMed]

8) Rhoads DD, Wolcott RD, Percival SL. Biofilms in wounds: management strategies. J Wound Care. 2008 Nov;17(11):502-8. [PubMed]

9) Pressure ulcer treatment. Agency for Health Care Policy and Research. Clin Pract Guidel Quick Ref Guide Clin. 1994 Dec;(15):1-25. [PubMed]

10) McInnes E, Jammali-Blasi A, Bell-Syer SE, Dumville JC, Middleton V, Cullum N. Support surfaces for pressure ulcer prevention. Cochrane Database Syst Rev. 2015 Sep 03;2015(9):CD001735. [PMC free article] [PubMed]

11) Batra RK, Aseeja V. VAC Therapy in Large Infected Sacral Pressure Ulcer Grade IV-Can Be an Alternative to Flap Reconstruction? Indian J Surg. 2014 Apr;76(2):162-4. [PMC free article] [PubMed]

12) Kranke P, Bennett MH, Martyn-St James M, Schnabel A, Debus SE, Weibel S. Hyperbaric oxygen therapy for chronic wounds. Cochrane Database Syst Rev. 2015 Jun 24;2015(6):CD004123. [PMC free article] [PubMed]

13) Langer, G., Knerr, A., Kuss, O., Behrens, J., & Schlömer, G. J. (2003). Nutritional interventions for preventing and treating pressure ulcers. Cochrane Database of Systematic Reviews. doi:10.1002/14651858.cd003216

14) Jakobsen, T. B. T., Pittureri, C., Seganti, P., Borissova, E., Balzani, I., Fabbri, S., … Fabbri, E. (2020). Incidence and prevalence of pressure ulcers in cancer patients admitted to hospice: A multicentre prospective cohort study. International Wound Journal. doi:10.1111/iwj.13317