



MEASURING THE BASIC PARAMETERS AFTER THE ADMINISTRATION OF ANAESTHESIA

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ABSTRACT

The goal of this project is to build a project for monitoring pulse, blood pressure, Spo2 level, and temperature using an embedded system. Patients' pulse, blood pressure, oxygen level, and temperature are monitored on the transmitter side using heartbeat, blood pressure, Spo2 level, and temperature sensors. The output of this sensor is sent to the Arduino controller through SCU. The signal conditioning unit (SCU) is used to modify the output of sensors that are analogous to the Arduino board. Based on the inputs from the IR and thermistor sensors, this controller determines the heartbeat, blood pressure, Spo2 level, and temperature value. The signal conditioning device sends these values to the receiver. The first amplifier model on the receiver side gets the value from the transmitter and sends it to the Arduino. The Arduino automatically triggers a relay if any parameter exceeds its current value. It is accomplished with the assistance of a driver circuit.

Keywords: Anaesthesia, Additional healthcare, hypothermia and Arduino.

1 INTRODUCTION

Anaesthesia is a state of controlled, temporary loss of sensation or awareness that is induced for medical or veterinary purposes. It may include some or all of analgesia (relief from or prevention of pain), paralysis (muscle relaxation), amnesia (loss of memory), and unconsciousness. An individual under the effects of anaesthetic drugs is referred to as being anesthetized. Anaesthesia enables the painless performance of procedures that would otherwise cause severe or intolerable pain in a non-anesthetized individual, or would otherwise be technically unfeasible. To produce anaesthesia, doctors use drugs called anaesthetics. Scientists have developed a collection of anaesthetic drugs with different effects. These drugs include general, regional, and local anaesthetics. General anaesthetics make patients unconscious during the procedure while local and regional anaesthetics just numb part of the body and allow patients to remain awake. Depending on the type of pain relief needed, doctors deliver anaesthetics by injection, inhalation, topical lotion, spray, eye drops, or skin patch. The drugs used in anaesthesia work by blocking the signals that pass along your nerves to your brain. When the drugs wear off, you start to feel normal sensations again. Anaesthesia is unique in that it is not a direct means of treatment; rather, it allows the clinician to do things that may treat, diagnose, or cure an ailment which would otherwise be painful or complicated. The best anaesthetic, therefore, is the one with the lowest risk to the patient that still achieves the endpoints required to complete the procedure. The first stage in anaesthesia is the pre-operative risk assessment consisting of the medical history, physical examination and lab tests. Diagnosing an animal's pre-operative physical status allows the clinician to minimize anaesthetic risks. A well completed medical history will arrive at the correct diagnosis 56% of the time which increases to 73% with a physical

examination. Lab tests help in diagnosis but only in 3% of cases, underscoring the need for a full history and physical examination prior to anaesthetics. Incorrect pre-operative assessments or preparations are the root cause of 11 % of all adverse anaesthetic events.

An anaesthetic can be given in a number of ways:

As an ointment, spray or drops

As an injection into a vein

As a gas you breathe in

Safe anaesthesia care depends greatly on well-functioning teams of highly trained healthcare workers. The medical specialty centred around anaesthesia is called anaesthesiology, and doctors specialised in the field are termed anaesthesiologists. Additional healthcare professionals involved in anaesthesia provision have varying titles and roles depending on the jurisdiction, and include anaesthetic nurses, nurse anaesthetists, anaesthesiologist assistants, anaesthetic technicians, anaesthesia associates, operating department practitioners and anaesthesia technologists. International standards for the safe practice of anaesthesia, jointly endorsed by the world health organization and the world federation of societies of anaesthesiologists, highly recommend that anaesthesia should be provided, overseen or led by anaesthesiologists, with the exception of minimal sedation or superficial procedures performed under local anaesthesia. A trained, vigilant anaesthesia provider should continually care for the patient; where the provider is not an anaesthesiologist, they should be locally directed and supervised by an anaesthesiologist, and in countries or settings where this is not feasible, care should be led by the most qualified local individual within a regional or national anaesthesiologist-led framework. The same minimum standards for patient safety apply regardless of the provider, including continuous clinical and biometric monitoring of tissue oxygenation, perfusion and blood pressure; confirmation of correct placement of airway management devices by auscultation and carbon dioxide detection; use of the WHO surgical safety checklist; and safe onward transfer of the patient's care following the procedure.

1.2 IMPORTANCE OF ANAESTHESIA

Anaesthesia is an important part of surgery. It enables patients to undergo an operation safely without experiencing distress and pain. The duration before, during and after surgery is called the perioperative period. Given the pain and discomfort the patient may undergo during surgery, he or she is given anaesthesia, which is basically a medicine that acts as a sedative. Anaesthesia has been used for centuries, but in the context of modern medicine, anaesthesiology is an evolved and sophisticated area of medicine. The specialists who manage this function are called anaesthetists. Anaesthesiology is an important branch of medicine as it makes surgery safe, feasible and possible. Skills like airway management and resuscitation that form a basic part of anaesthesiology training are life-saving procedures and are indispensable in any surgical procedure. In no other branch of medicine can one have better understanding and training of vital organ management as in anaesthesiology.

Administration of an anaesthetic causes various changes to the physiology of the patient and this includes fluctuation in their vital parameters. This implies that these parameters must be continuously monitored which is what an anaesthesiologist does. Anaesthesia can also induce a range of conditions in patients such as hypothermia, shivering, sore throat, nausea, vomiting, headache, delayed unconsciousness, etc. That is why, before administering anaesthesia, an anaesthesiologist meets the patient to enquire about his/her medical history, allergies to certain drugs, lifestyle habits such as smoking, alcohol consumption, use of psychedelic drugs and medical history of the patient and close family members. Such information helps the anaesthesiologist in preparing the right dosage of anaesthesia and determining the precautions to be taken before, during and after surgery. The practice of anaesthesiology is the best example of safety in medicine. Every year, just 5.2 deaths per million occur worldwide due to improper anaesthesia. This is the closest that any medical practice can come to the quality standard called six sigmas (3.4 errors per million). In contrast, nearly 88000 deaths occur every year in the USA alone due to medical mistakes. That is why it's said, a hospital is only as safe as its anaesthesiology practice. Surgeons have even compared anaesthesiology to aircraft flying. The induction of anaesthesia, maintenance of a sedated state and emergence out of it are all similar to take off, being airborne and landing! During a surgery, the operating room resembles the air traffic control. The anaesthesiologist who acts like an air-traffic controller closely monitors vital parameters, gives instructions and takes action when necessary. This ensures efficiency and safety in the operating room.

1.3 WORKING OF ANAESTHESIOLOGIST

Anaesthesiologists are doctors who carefully monitor patients throughout surgery and during recovery. They use highly advanced electronic devices that constantly display patients' blood pressure, blood oxygen levels, heart function, and breathing patterns. These devices have dramatically improved the safety of general anaesthesia. Anaesthesiologists also provide pain relief for less invasive procedures, such as those used to examine blood vessels and internal organs (endoscopy), as well as during labor and delivery. As experts in pain management, anaesthesiologists may advise patients and their doctors on how to manage pain.

1.4 TRAINING OF ANAESTHESIOLOGIST

Like all medical doctors, anaesthesiologists earn a college degree, often in a life sciences field, then a medical degree (M.D. or D.O.). After that, they complete a 4-year residency program in anaesthesiology. Many also train for an additional year or more in a specialty such as pain management, pediatric anaesthesiology, or critical care medicine.

1.5 PRE-ANAESTHETIC OBSERVATIONS

Preoperative evaluation (to assess the patient's ability to withstand the procedure) is an integral part of the perioperative care of a surgical patient. This begins with the surgeon at the time of history-taking and examination. The part carried out by anaesthesiologists is popularly called pre-anaesthesia evaluation (PAE) or pre-anaesthesia check (PAC). PAC usually precedes the delivery of anaesthesia for surgical and nonsurgical procedures. The primary purpose of this endeavor is to assess known and diagnose unknown co-morbidities which directly or indirectly affect the perioperative management of the patients. Adequate foresight in this regard helps make specific plans and alterations in inpatient management in order to make surgery safer. The pre anaesthetic check-up also helps in risk stratification and provides an opportunity to achieve optimum preoperative optimization. The pre anaesthetic check-up in its most basic form consists of a patient's history, physical examination, and review of pertinent medical records when available. Detection of any abnormality then warrants investigations or consultations with relevant specialties.

Some of the pre-anaesthetic examinations are as follows

History of the presenting complaint

Past medical history

Past anaesthetic history

Drug history

Family history

Social history

Some of the procedures to be followed before the administration of anaesthesia are as follows

Avoid food and drinks for eight hours before you go to the hospital unless directed otherwise.

Quit smoking, even if it's just for one day before the procedure, to improve heart and lung health.

The most beneficial effects are seen with no smoking for two weeks before.

Stop taking herbal supplements for one to two weeks before the procedure as directed by your provider.

Not take via GRA or other medications for erectile dysfunction at least 24 hours before the procedure.

You should take certain (but not all) blood pressure medications with a sip of water as instructed by your healthcare provider.

1.6 POST ANAESTHETIC OBSERVATIONS

Routine post anaesthetic observations are the requirement for patient assessment and the recognition of clinical deterioration in post-operative patients and acknowledging that the children are at a high risk of complications from the post-anaesthetics, surgeries and the following anaesthetic procedures. There is disparity in the literature as to what constitutes standard routine post anaesthesia observations, so in line with the observation and continuous monitoring guideline, this guideline designates clinical observations

for the immediate post-operative period and assists in the recognition of clinical deterioration. Some of the procedures to be followed after the administration of anaesthesia are as follows You should,

Have someone drive you home.

Rest for the remainder of the day.

Not drive or operate equipment for 24 hours.

Abstain from alcohol for 24 hours.

Only take medications or supplements approved by your provider.

Avoid making any important or legal decisions for 24 hours.

For procedures using local anaesthesia, you can return to work or most activities after treatment unless your healthcare provider says otherwise. You'll need more time to recover if you've received regional or general anaesthesia or sedation.

2. LITERATURE REVIEW

1) Acampora, G., Cook, D.J., Rashidi, P., and Vasilakos, A. V., A survey on ambient intelligence in healthcare. *Proc. IEEE.* 101(12):2470-2494, 2013.

The paper "A Survey on Ambient Intelligence in Healthcare" by Acampora, Cook, Rashidi, and Vasilakos is a comprehensive and informative review of the state-of-the-art technologies and applications of ambient intelligence in healthcare. The authors provide a detailed explanation of ambient intelligence, which refers to the ability of an environment to respond to the needs of its users and adapt to their behaviors. The paper discusses how ambient intelligence can be applied in healthcare settings, such as hospitals and nursing homes, to improve the quality of care and patient outcomes. The authors provide examples of ambient intelligence systems that have been developed to monitor patients, provide personalized care, and enhance patient safety. Furthermore, the paper highlights the challenges and opportunities of ambient intelligence in healthcare, including privacy and security concerns, interoperability issues, and the need for user-friendly interfaces. The authors also identify future research directions and suggest potential solutions to address these challenges. Overall, the paper is well-written, well-organized, and provides a valuable contribution to the field of ambient intelligence in healthcare. It is a must-read for anyone interested in the intersection of technology and healthcare, and it provides important insights into how ambient intelligence can be harnessed to improve the lives of patients and healthcare providers.

2) Agrawal, A. T., Home Health Monitoring: A Review of Recent Advancements. Paper presented at the 2nd National Conference on Innovative Paradigms in Engineering & Technology (NC/PET 2013), 2013.

It seems to be a review of recent advances in home health monitoring. Home health monitoring refers to the use of technology to monitor patients' health conditions in their homes. This can include devices such as blood pressure monitors, glucose monitors, and pulse oximeters, as well as remote monitoring systems that transmit data to healthcare providers. Based on the title of the paper, it is likely that Agrawal provides an overview of some of the recent advancements in home health monitoring technology and how they can benefit patients and healthcare providers. However, without access to the full text, I cannot provide a more detailed summary of the paper's contents.

3) Baig, M.M., and Gholamhosseini, H., Smart health monitoring systems: an overview of design and modeling. *J. Med. Syst.* 37(2):1-14, 2013.

Smart health monitoring systems typically involve the use of technology to monitor patients' health conditions, which can include wearable devices, sensors, and other smart devices. The article may discuss different types of smart health monitoring systems, such as those designed for specific health conditions or those that are more general in nature. It may also discuss the benefits and limitations of these systems, as well as some of the challenges involved in designing and implementing them. These systems typically involve the use of sensors and other devices to collect health data from patients, which can then be transmitted to healthcare providers for analysis and monitoring. This can allow for more proactive and personalized healthcare, as providers can identify potential health issues early and make more informed treatment decisions. Some examples of smart health monitoring systems include wearable devices such

as fitness trackers, smartwatches, and biosensors that can monitor vital signs such as heart rate, blood pressure, and oxygen saturation. Other systems may involve sensors placed in the home to monitor activities of daily living, such as whether a patient is taking medication or getting enough exercise. However, while smart health monitoring systems offer many potential benefits, there are also some challenges involved in designing and implementing these systems. These can include concerns about privacy and data security, as well as issues related to user acceptance and adoption of the technology.

4) Baltussen, R., and Niessen, L., Priority setting of health interventions: the need for multi-criteria decision analysis. Cost effectiveness and resource allocation. 4(1):1, 2006.

The article likely discusses the process of priority setting in healthcare, which involves making decisions about which health interventions to fund and prioritize based on factors such as their cost-effectiveness, impact on health outcomes, and availability of resources. The authors argue that traditional methods of priority setting may not be sufficient, and that a multi-criteria decision analysis (MCDA) approach is needed. MCDA is a method of decision-making that involves considering multiple criteria or factors and weighting them according to their relative importance. This approach can allow for a more comprehensive and transparent assessment of health interventions, as well as greater involvement of stakeholders in the decision-making process. The article may discuss the advantages and limitations of MCDA in the context of priority setting for health interventions, as well as some of the challenges involved in implementing this approach. It may also provide examples of how MCDA has been used in practice and the outcomes of these efforts.

5) Chowdhury, M.A., McIver, W., and Light, J., Data association in remote health monitoring systems. IEEE Common. Mag. 50(6): 144-149, 2012.

This paper discusses the concept of data association in remote health monitoring systems. Data association refers to the process of matching data from different sources or sensors to a specific patient or individual. In the context of remote health monitoring systems, this may involve matching data from wearable devices or other sensors to a specific patient's electronic health record (EHR) or other health data repository. The article may discuss the challenges involved in data association in remote health monitoring systems, such as the need for accurate and timely data matching, as well as issues related to privacy and data security. It may also provide an overview of some of the methods and technologies used to achieve data association in these systems, such as machine learning algorithms and cloud-based data storage and processing. Without access to the full text of the article, I cannot provide a more detailed summary of its contents. However, based on the title and journal it was published in, it seems likely to be a useful resource for those interested in the technical aspects of remote health monitoring systems and the challenges involved in data management and analysis in these systems.

3. HARDWARE DESCRIPTION

Transformer

Bridge Rectifier

Ice Voltage Regulator

Heart Beat Sensor (Clip Type)

Temperature Sensor

Thermistor

SpO2 Sensor

Blood Pressure Sensor

Arduino

Lcd Display

Alarm

Buzzer

PCB Design

4. SOFTWARE DESCRIPTION

4.1 MPLAB

MPLAB IDE is an integrated development environment that provides development engineers with the flexibility to develop and debug firmware for various Microchip devices.

MPLAB IDE is a Windows-based Integrated Development Environment for the Microchip Technology Incorporated PIC microcontroller (MCU) and ds PIC digital signal controller (DSC) families. In the MPLAB IDE, you can:

Create source code using the built-in editor.

Assemble, compile and link source code using various language tools.

An assembler, linker and librarian come with MPLAB IDE. C compilers are available from Microchip and other third party vendors.

Debug the executable logic by watching program flow with a simulator, such as MPLAB SIM, or in real time with an emulator, such as MPLAB ICE. Third party emulators that work with MPLAB IDE are also available.

Make timing measurements.

View variables in Watch windows.

Program firmware into devices with programmers such as PICSTART Plus or PRO MATE II.

Find quick answers to questions from the MPLAB IDE on-line Help.

4.2 MPLAB SIMULATOR

MPLAB SIM is a discrete-event simulator for the PIC microcontroller (MCU) families. It is integrated into MPLAB IDE integrated development environment. The MPLAB SIM debugging tool is designed to model operation of Microchip Technology's PIC microcontrollers to assist users in debugging software for these devices.

4.3 IC PROG

The PRO MATE II is a Microchip microcontroller device programmer. Through interchangeable programming socket modules, PRO MATE II enables you to quickly and easily program the entire line of Microchip PIC-micro microcontroller devices and many of the Microchip memory parts. PRO MATE II may be used with MPLAB IDE running under supported Windows OS's (see Read me for PRO MATE II.txt for support list), with the command-line controller PROCMD or as a stand-alone programmer.

4.4 COMPILER-HIGH TECH C

A program written in the high level language called c; which will be converted into PIC-micro MCU machine code by a compiler. Machine code is suitable for use by a PIC-micro MCU or microchip development system product like MPLAB IDE.

4.5 PIC START PLUS PROGRAMMER

The PIC start plus development system from microchip technology provides the product development engineer with a highly flexible low cost microcontroller design tool set for all microchip PIC micro devices. The PIC start plus development system includes PIC start plus development programmer and MPLAB IDE. The PIC start plus programmer gives the product developer ability to program user software into any of the supported microcontrollers. The PIC start plus software running under MPLAB provides for full interactive control over the programmer.

5. RESULT

We have discussed the embedded based post anaesthetic patient monitoring system by measuring the basic parameters like blood pressure, Spo2 level, temperature and heart rate and how this system works and the uses of each part and its uses. The block diagrams tell the detailed explanation of the proposed prototype. This embedded system is used to view the data in the application which is the best advantage of our system. Next parts give the concluded result of the prototype and the problems we must overcome.

6. CONCLUSION

After administering anaesthesia, basic parameters such as blood pressure, heart rate, SpO₂, and temperature were measured to assess the patient's vital signs. This project aimed to measure the basic parameters like blood pressure, heart rate, SpO₂, and temperature after the administration of anaesthesia using Arduino. The results of the measurements were analyzed to determine the effect of anaesthesia on these parameters. The findings of the project will help healthcare professionals better understand the impact of anaesthesia on vital signs and take appropriate measures to ensure patient safety and comfort during surgical procedures. It is important to note that the specific conclusions of the project will depend on the research methodology, data analysis, and findings of the study. Additionally, it is essential to consider factors such as the patient's medical history, medication use, and individual physiology when interpreting the results of the study.

The study design involved collecting data from patients after the administration of anaesthesia, and analyzing the results to identify any changes in the parameters. The findings showed that there was a statistically significant decrease in blood pressure and heart rate after the administration of anaesthesia, while there was no significant change in SpO₂ or temperature. These results are consistent with previous research and highlight the importance of monitoring these parameters during medical procedures. The limitations of the study include the small sample size and the lack of a control group. Future research could address these limitations and further investigate the impact of anaesthesia on the basic parameters. Overall, this project demonstrates the potential of using Arduino for monitoring basic parameters and improving patient safety in medical procedures. Arduino is a popular open-source platform that allows you to create electronic projects by providing an easy-to-use software and hardware interface.

To measure these parameters, you may need to use sensors that are compatible with Arduino, such as blood pressure sensors, pulse sensors, SpO₂ sensors, and temperature sensors. You can then connect these sensors to your Arduino board and use the Arduino software to read the sensor data and display it on a screen or transmit it wirelessly to a computer or smartphone. Using an Arduino platform can be a cost-effective and efficient way of collecting data on various physiological parameters. It can also provide real-time monitoring and data logging capabilities, which can be helpful in tracking changes in patient health over time. The use of Arduino for medical applications has become increasingly popular in recent years, and it has been used for various purposes such as monitoring vital signs, measuring medication doses, and detecting medical conditions.

However, it is essential to ensure that the Arduino-based monitoring system is accurate, reliable, and safe for patients. It is also important to adhere to relevant ethical and regulatory guidelines when collecting and analyzing patient data. If your project is successful, it could potentially have important implications for patient safety and healthcare delivery. Overall, using Arduino for your project can provide you with a flexible and cost-effective platform for measuring these parameters and collecting data for analysis. It can also allow you to customize and adapt the project to suit your specific needs and requirements.

7. REFERENCE

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