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DIAGNOSTIC ACCURACY OF GOLD STANDAR AND PH SENSOR PROTOTYPE FOR CANCER PATIENT

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ABSTRACT
Diagnosis is an integral part of quality health care in the nursing care process. Enforcement of the diagnosis can be optimal if accompanied by supporting objective data. Cases of nausea and vomiting that occur as a result of the effects of chemotherapy can certainly be minimized if the value of stomach acid is known, which is the objective data for these patients. This prototype is useful for assisting diagnosis in assessing the pH of stomach acid that occurs. Objective: The purpose of this study is to find a correlation value that can compare and assess the error score of the prototype being developed. Method: Research and development used in this study aims to determine the comparison of product values with the standard tools used. Sample consists of 55 selected reagents with pH results that will be compared between standard pH tools and prototype. Data analysis uses an accuracy formula based on the formulation Results: The data accuracy value was 99.87% and the data analysis used Mann Whitney with a value of> 0.05, stating that there was no difference in the score obtained from the prototype and the standard tools used Conclusions: These results indicate that the prototype with accurate values can be used to help obtain the pH value of stomach acid in cancer patients so that treatment can be given optimally.

Keywords: cancer patients; gastric acid; health care; nausea; vomiting

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INTRODUCTION

Treatment of cancer patients is included in palliative care which aims to improve the quality of life. The quality of life for cancer patients is also related to the prognosis of treatment that the cancer patient will undergo. Treatment for cancer patients consists of three types of treatment, namely chemotherapy, radiation and hormonal treatment. The treatment undertaken by cancer patients has both physical and psychological impacts on these patients. One effect that is very much felt by cancer patients, especially during chemotherapy treatment is nausea and vomiting and occurs in more than 60% of patients (Indrawati et al., 2023; Susanti et al., 2012). The nausea and vomiting that will be felt in these patients will actually have an impact on nutritional fulfillment and the continuation of chemotherapy therapy. In addition to causing nausea and vomiting, the decline in the quality of life of patients after chemotherapy can also cause anxiety and disruption of social function (Setiawan, 2015; Sugihartono et al., 2022).

Cancer patients have a prevalence that is increasing from year to year. The number of cancer patients increased from 1.4 per 1000 population in 2013 to 1.79 per 1000 population in 2018(Chang et al., 2019; Hartono & Lesmana, 2019). Predictions from the Ministry of Health

of the Republic of Indonesia reveal that in 2030 there will be an increase in cancer patients to 26 million cancer patients and 17 million cancer patients will die. Cancer patients certainly need investigations to improve their prognosis. One of the supporting examinations is by examining pH stomach acid that can facilitate patient treatment (Adhisty et al., 2020; Miftahussurur et al., 2021). The treatment given to overcome by administering antiemetic drugs as a pharmacological action or providing complementary therapy, for example giving citrus aromatherapy or ginger as a non-pharmacological action (Adhisty, 2019). Handling actions by administering drugs has an effect that causes the body to weaken, decrease appetite and dehydration (Setiawan, 2015). Seeing that the management of nausea and vomiting relies heavily on antiemetic therapy, it is necessary to determine the pH value in these patients. The aims of this research is to assess the accuracy of the gastric acid prototype device.

METHOD

This study used a research and development approach which consists of 10 stages. The stages in this study were to compare the scores of the prototype and standard tools. Research ethics number 175/ kepkrsmhfkunsri/2020 from the ethics committee of RSUP DR. Mohammad Hoesin and the medical Faculty, Sriwijaya University have approved this research. The methodology used in this study is to calculate the error value by comparing the values obtained from the prototype and standard tools. The accuracy value is calculated based on the formula (Anjarsari et al., 2015), with the formula Accuracy (%) = 100% - Error (%). The bivariate data analysis used the Mann Whitney statistical test to determine whether there was a difference between these two tools.

Tools and Materials

The system is designed with a range of tools: pH sensor E201-C, microcontroller, Arduino Uno, Datalogger shield, LCD 2004 + 12C backpack, pH meter and connector cable System The series of systems using tools and materials that shown in the following sketches and figures:

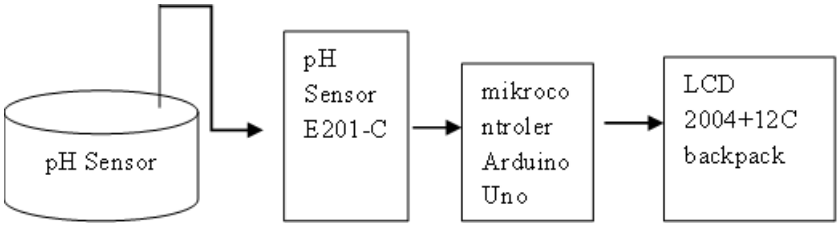

Figure 1. pH system chart

Figure 2. pH sensor prototype

This series of systems has a receptor at the end of the sensor that will be able to detect the acidity value through an electronic ion exchange mechanism in the measured ocean. The ion exchange will create an electric current so that the voltage will be obtained. The voltage coming from the pH sensor will processed on the Arduino Uno and converted to ADC. This ADC has a function to process data so that the data can be displayed on the LCD screen (Adhisty et al., 2020; Setyowati et al., 2020). The sample were the reagens which aims to compare of the pH results obtained on the standard and prototype tools on the selected sample solutions. The comparison values are depicted in table 1 with the error value for each sample. The sample calculation using the calculation obtained as many as 55 samples for the comparison of values. The standard tool used the CT-6022 model which has a Ce certificate. The accuracy of this tool is at a level of 0.02 pH / 0.5 C

RESULTS

Table 1.
Comparison of the pH value of standard and prototype tools

pH Score		Error Score
Standard Tools Score	Prototype Score	
3.87	3.83	0.04
3.55	3.56	0.01
3.7	3.67	0.03
2.53	2.73	0.20
2.05	2.68	0.63
3.65	3.84	0.19
6.65	7.93	0.56
3.9	4.46	0.56
8.08	7.41	0.67
5.1	5.17	0.06
3.08	2.88	0.20
6.61	6.62	0.01
8.6	8.65	0.05
7.19	7.17	0.02
5.78	5.64	0.14
2.4	2.46	0.06
4.47	4.51	0.04
3.33	3.61	0.28
7.39	7.24	0.15
3.96	3.91	0.05
7.2	7.15	0.05
7.01	6.9	0.01
7.02	7	0.02
4.5	4.43	0.02
6.2	6.18	0.02
6.04	6.06	0.02
4.46	4.46	0.00
6.48	6.39	0.09
3.38	3.73	0.35
6.01	5.99	0.02
3.21	3.53	0.32
5.24	5.31	0.07
3.33	3.63	0.30
5.16	5.18	0.02
2.86	2.9	0.04
8.68	8.44	0.24
5.82	5.84	0.02
9.39	9.23	0.16

pH Score		Error Score
Standard Tools Score	Prototype Score	
8.72	8.6	0.12
12.01	12.03	0.02
2.46	2.44	0.02
2.35	2.4	0.05
4.09	4.05	0.04
3.86	3.75	0.11
4.53	4.5	0.03
8.07	8.03	0.04
4.57	4.4	0.17
3.39	3.2	0.19
6.78	6.66	0.12
3.9	3.86	0.04
2.69	2.5	0.19
2.79	2.83	0.04
6.32	6.45	0.13
3.93	3.79	0.14
9.23	9.05	0.17

Table 1 shows the results of the comparison in the correlation value between standard tool and the prototype. The largest error value is 0.67% and the smallest error is 0.01%. The average error value obtained is 0.13%. The accuracy value is calculated based on the formula (Anjarsari et al., 2015) formula Accuracy (%) = 100% - Error (%) Based on this formula, the accuracy value obtained is 99.87%.

The difference in the value of the standard tool and the prototype for the stomach acid detector

The results of the bivariate test used the Mann Whitney statistical test because the data were not normally distributed. This was to find out whether there was a difference in test results between standard tools and stomach acid detectors

Table 2.
The Difference of standard and pH prototype tools

pH Detection	f	Mean	*p-value*
Standard Tools	55	55.40	0.974
Prototype	55	55.60	

Table 2, the data obtained that *p-value*> 0.05, which indicates that there is no difference between the value of the standard tool and the value of the prototype. Medical standard devices that can be used for humans must have a minimum value of 95%, so this prototype allows for use in humans.

DISCUSSION

Investigation is one of the important factors to detect a patient's diagnosis and prognosis correctly. This definition is important for clinicians to obtain in explaining the symptoms experienced by patients so as to prevent patient discomfort, this will also make patient diagnosis more accurate and prevent higher health costs (Niriella et al., 2022). Cancer patients will generally get chemotherapy as one of the treatment therapies Chemotherapy is an agent that can oxidize the patient's intestinal cells by stimulating serotonin. Cancer patients with confirmed causes can make it easier for physicians to give anti-emetics to patients (Gupta et al., 2021).This pH sensor detector is a tool that is able to diagnose and also helps in pharmacological and non-pharmacological treatment of these patients. This stomach acid pH detector is designed to use a working system that automatically measures the acid from a predetermined liquid.

The degree of acidic pH will be detected using an electode (measured probe) located on the pH sensor, this tool will measure the amount of H3O+ ions in the solution. The tip of the electrode (bulb) containing the HCL solution (0.1 mol / dm3) has the ability to exchange positive ions (H+) with the measured solution. If the solution is acidic, then H+ ions will be bound to the surface of the bulb. The ion exchange that occurs at this time is an important time in measuring pH (Adhisty et al., 2020; Wahyudia et al., 2021). Nausea and vomiting are one of the many side effects of chemotherapy that can cause anxiety and the ineffectiveness of therapy that can cause physical and psychological tension (Mustian et al., 2011; Triyani et al., 2021). Research from (Tan et al., 2022) explains that the incidence of nausea and vomiting in acute and delayed types is the 2 types of events that occur most in cancer patients. This prevalence can certainly help health workers to reduce the incidence of decreased quality of life of patients can be identified early, The use of this tool is certainly a tool that can be used by many health workers to help patients deal with symptoms of nausea and vomiting, and thereby reduce the prevalence of nausea and vomiting in patients after chemotherapy.

CONCLUSION

Investigations are one of the determinants of diagnosis in patients so that tools are needed to help the examination. This pH sensor prototype based on research is an 99.87% of error value while testing based on statistics states that there is no difference between standard and prototype tools so it can be concluded that this prototype can be used to measure pH meter as one of the actions needed to aid diagnosis and treatment patient.

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