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Application of the Spirometer and Oximeter Telemedicine Smartphone System in Lung Health Examination of Fish Smoking Workers in the Kenjeran Community Health Center working area

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ABSTRACT The Community Service Program with the PKM scheme is implemented in the form of synergistic collaboration between the Surabaya Ministry of Health Polytechnic and the Surabaya City Health Service which is oriented towards community independence through counseling and assistance, especially in the implementation of the use of tools. Implementation of the Use of Spirometers and Oximeters Telemedicine Smart Phone System in Lung Health Examinations - Lungs of fish smoking workers in the Kenjeran Community Health Center work area. In connection with the increase in patients with cases of respiratory problems in the Kenjeran Community Health Center area, Surabaya City as well as cases of respiratory problems in post-Covid 19 patients which has resulted in a lack of treatment for these patients due to limited health personnel and no monitoring equipment. insufficient, so that the health service system for patients is disrupted. The use of a spirometer with a telemedecine smart phone system is expected to help people in Indonesia, especially in the Surabaya city area, to be able to carry out early examinations independently and be able to provide this information to medical personnel if there are things that are outside the specified parameters. This activity is an application of research in accordance with the road map (Road map Research) which has been carried out starting in 2019 to design an Apnea monitor to detect respiration rate in babies and adults using Piezoelectric sensors. Until 2024, it has been developed with a spirometer and oximeter with a telemedicine smart phone system and has been published in the journal IJEEMI, 2024 with the title Design and Development of an IoT-based Pulmonary Function and Oxygen Saturation Measurement Device (Pulmonary Function Analysis). In this activity, 21 fish smoking workers in the Kenjeran Community Health Center work area were examined using a spirometer and oximeter smartphone telemedicine system carried out by the Team. Resulted in lung function measurements with FEV1/FVC ratio values, 86% normal and 14% restrictive.

INDEX TERMS Spirometer, Fish Smoking Worker

I. INTRODUCTION

The residential area of Kenjeran fish smoking workers is one of the working areas of the Kenjeran Health Center, the majority of which are fish smoking workers. Based on the results of the analysis, problem identification was found. It was found that the prevalence of disease cases is still high and the facilities and infrastructure as well as human resources are inadequate.

Furthermore, a solution to this problem was found, namely the need for counseling and assistance in the application of pulmonary health monitoring equipment with spirometers and oximeters using the Telemedicine Smartphone System (TMSS) for health workers and the community in the Puskesmas area in community service activities at the Health Polytechnic of the Ministry of Health Surabaya.

The implementation of TMSS can significantly improve lung health monitoring among fish smoking workers in the Kenjeran area. This technology-based approach will allow for real-time data collection and analysis, potentially leading to early detection of respiratory problems. Additionally, the use of TMSS can improve the efficiency of health care delivery in the region, allowing for more targeted interventions and better allocation of limited resources. The purpose of this service is to implement TMSS for effective lung health monitoring in fish smoking workers, ensure early detection of potential respiratory problems and directly increase public knowledge and awareness of the importance of COPD prevention.

II. METHODS

The implementation method used is like the following flow diagram which depicts the flow of PkM activities, namely counseling and mentoring (Socialization) Application of the Use of Spirometers with Telemedicine Smartphone System (TMSS) in Respiratory Disorder Cases in the area Kenjeran Community Health Center

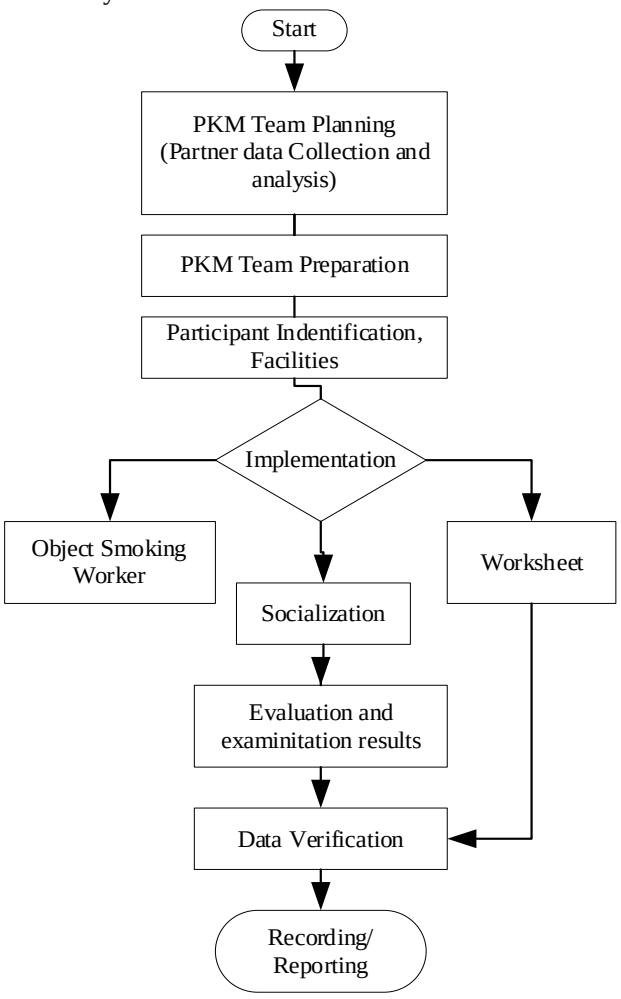

FIGURE 1. Flow of Educational Activities on The Implementation of The Use of Spirometer TMSS

Explanation of the flow diagram image:

1. The team plans by collecting and analyzing partner data, then submits a PKM proposal which is known to the Head of the PPM Center and approved by the Director of the Health Polytechnic, Ministry of Health, Surabaya.
2. The Head of the PKM Team for the Health Polytechnic, Ministry of Health, Surabaya, identified the participants by asking the Head of the Kenjeran Community Health Center to appoint 2 Health officers/technical personnel and 40 people from the community worker group as participants who will carry out lung function measurements with spirometers and oximeters, which is an implementation of the application of spirometers and oximeters. telemedicine smartphone system from the PKM Poltekkes Team, Ministry of Health, Surabaya
3. The PKM Team carries out the implementation stages starting from the PKM Team Training itself. (according to the division of tasks)
4. Next, the PKM Team begins to carry out technical assistance (education) with community health center officers by means of direct demonstration. Activities begin by recording identity, measuring equipment according to the worksheet.
5. Participants fill in the attendance list and identify them provided by the PKM Team.
6. Data processing is carried out from participant evaluations (measurements) and worksheets then verified.
7. Next, reporting is carried out to the Head of the Kenjeran Community Health Center and Health Polytechnic, Ministry of Health, Surabaya.

III. RESULT

1. SURVEY AND COLLET DATA REGARDING FISH SMOKING WORKERS

Data collection has been carried out on workers in fish smoking villages in the Kenjeran Community Health Center working area.The following data was obtained: there were 40 workers who actively carried out routine health checks at the Kenjeran Community Health Center. The age limit is between 30 to 80 years. In the community service activities carried out by the Health Polytechnic Team, 21 participants were assigned to undergo lung health examinations using a spirometer and oximeter. The following is a photo of the data collection

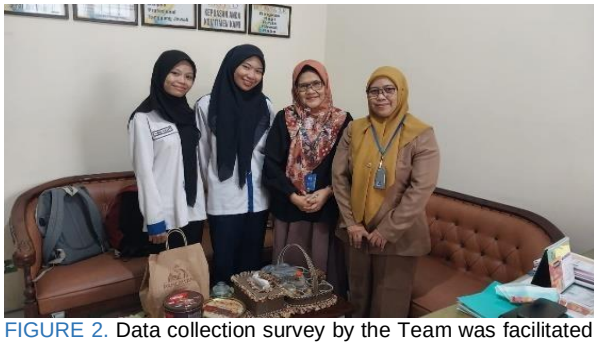

FIGURE 2. Data collection survey by the Team was facilitated by Head of the Kenjeran Community Health Center

survey activity:

2. SOCIALIZATION FOR DOCTORS, PARAMEDICS, CADRES AND FISH SMOKING WORKERS IN THE KENJERAN COMMUNITY HEALTH CENTER AREA

FIGURE 4 Socialization has been carried for doctor, paramedics, cadres and fish smoking workers in the Kenjeran Community Health Center area as well as students regarding lung health checks using a smartphone telemedicine system spirometer and oximeter. This activity

FIGURE 4. Socialization activities by the PkM Team

was carried out by the Poltekkes Community Service Team at the Health Service Post in the Kenjeran sub-district area. Below are several photos of socialization activities by the Surabaya Ministry of Health Polytechnic PkM Team and the Community Health Center team:

3. HEALTH EXAMINATION OF FISH SMOKING WORKERS IN THE KENJERAN HEALTH CENTER WORK AREA

Health checks of fish smoking workers, especially lung health, have been carried out using a spirometer and smartphone telemedicine oximeter system carried out by the PKM Team. Following are several photos of the activities of The Ministry of Health Surabaya Polytechnic Community Service Team and the Kenjeran Community Health Center team as well as the Kenjeran village cadre team at the location of the fish smoking village in the Kenjeran community health center area see FIGURE 5 and FIGURE 6.

FIGURE 5. Trial of Spirometer in the community by the PkM Team

FIGURE 6. Health examination activities using a TMSS Spirometer and Oximeter

The use of spirometers in community activities by the Community Service Team) aims to increase public awareness of lung health. The results of this activity are not only useful tools to monitor lung function but also educate the public about the importance of maintaining lung health, especially workers who work in the fish smoking industry. FIGURE 5 shows the spriropmetric ratio of fish fumigation workers. FIGURE 7 shows the ratio of BPM and SPO2 levels. The BPM parameter is used to determine heart rate, which indicates a specific level of physical activity, stress, or health condition. Meanwhile, SPo2 is the percentage of oxygen bound to hemoglobin in the blood, to ensure that the body's tissues get enough oxygen. Ideal conditions for BPM

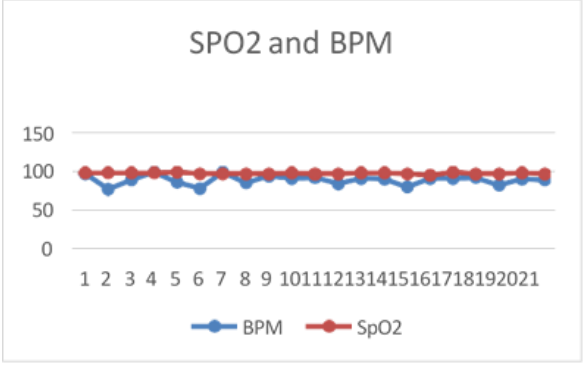

FIGURE 7 Graph of Respondents' BPM and SPO2 measurement ratios

typically range from 60 to 100 beats per minute, while a healthy SPo2 is generally above 95%.

TABLE 1, Results of measuring the lung health of fumigation workers using a spirometer. From the tables and graphs, the results show that on the Spirometer and SPO2 monitor, BPM can be applied to measure 21 workers with the lowest SPO2 value of 94%, the highest 98%, then the lowest BPM value of 76%: highest 98%. And measuring lung function with a spirometer produces FEV1/FVC ratio values, normal as much as 86% and restrictive as 14%.

IV. CONCLUSION

Implementation of PKM with the PKM theme in the activity of using the Spirometer Monitor with Telemedicine Smartphone (TMSS) in examining the lung health of fish smoking workers in the Kenjeran Community Health Center area. The results achieved in this PKM activity are:

1. Have conducted a survey and data collection on fish smoking workers in the Kenjeran fish smoking area, Surabaya.
2. Outreach to doctors, paramedics, cadres and fish smoking officers in the Kenjeran Community Health Center as well as students regarding lung health checks using spirometers and TMSS oximeters carried out by the Team.
3. Examination of 21 fish smoking workers in the Kenjeran Community Health Center working area using a spirometer and TMSS oximeter carried out by the PKM Team resulted in lung function measurements with an FEV1/FVC ratio value of 86% normal and 14% restrictive.
4. Report the results of the PkM and give souvenirs to the Head of Kenjeran Community Health Center, Paramedics, Cadres and fumigation officers (respondents)
5. Implementation of the use of Spirometer monitors which can reduce costs (low cost) for users, especially partners (Pukermas Kenjeran) because telemedicine can be done with Android access.

Suggestions

From the results of these mentoring and counseling activities, it is recommended that paramedical and technical staff as well as cadres at the Kenjeran Community Health Center

1. Use an Android cellphone that supports tool software applications.
2. The Spirometer with Oximeter using the Telemedicine Smartphone System should be developed for market products so that it can be used to help the community, especially in community health centers in areas at risk of respiratory problems

TABLE 1
Respondents' Respiration Measurement Results

No.	Res	H	W	BPM	SpO2	Ratio FEV1/FVC	Result
1.	Sa	153	89	96	97	87%	**Normal**
2.	Su	143	43	76	97	70%	**Normal**
3.	En	158	70	88	97	85%	**Normal**
4.	Mu	159	90	98	97	87%	**Normal**
5.	Ma	157	69	85	98	53%	**Normal**
6.	Ru	151	76	77	96	90%	**Normal**
7.	As	142	64	98	96	100%	**Normal**
8.	Ai	155	85	84	96	76%	**Normal**
9.	Su	155	71	93	96	100%	**Normal**
10.	Is	145	38	90	97	80%	**Normal**
11.	Tri	138	59	91	96	77%	**Normal**
12.	Su	145	48	83	96	100%	**Normal**
13.	Gh	158	55	90	97	100%	**Normal**
14.	Su	157	75	89	97	100%	**Normal**
15.	Mu	153	59	79	96	86%	**Normal**
16.	Wa	157	64	90	94	72%	**Normal**
17.	Ma	145	59	90	98	30%	**Restructive**
18.	Wi	157	66	91	96	29%	**Restructive**
19.	Fa	144	46	81	96	35%	**Restructive**
20.	Ro	155	53	89	97	21%	**Restructive**
21.	**Um**	**161**	**35**	**88**	**96**	**48%**	**Restructive**

REFERENCES

[1] Rahmadika Eka Yuwana1, Sari Luthfiyah1, and Her Gumiwang Ariswati1 Design and Development of an IoT-based Pulmonary Function and Oxygen Saturation Measurement Device (Pulmonary Function Analysis), IJEEMI-2023

[2] et al., "Asthma inflammatory phenotypes on four continents: most asthma is non-eosinophilic," Int. J. Epidemiol., no. August 2022, pp. 611–623, 2022, doi: 10.1093/ije/dyac173.

[3] R. Kwizera et al., "Burden of fungal asthma in Africa: A systematic review and meta-analysis," PLoS One, vol. 14, no. 5, pp. 1–17, 2019, doi: 10.1371/journal.pone.0216568.

[4] C. C. M. De Jong et al., "Diagnosis of asthma in children: The contribution of a detailed history and test results," Eur. Respir. J., vol. 54, no. 6, 2019, doi: 10.1183/13993003.01326-2019.

[5] B. S. Stikker, R. W. Hendriks, and R. Stadhouders, "Decoding the genetic and epigenetic basis of asthma," Allergy Eur. J. Allergy Clin. Immunol., no. October 2022, pp. 940–956, 2023, doi: 10.1111/all.15666.

[6] A. da S. Fleck, M. L. Sadoine, S. Buteau, E. Suarthana, M. Debia, and A. Smargiassi, "Environmental and occupational short-term exposure to airborne particles and fev1 and fvc in healthy adults: A systematic review and meta-analysis," Int. J. Environ. Res. Public Health, vol. 18, no. 20, 2021, doi: 10.3390/ijerph182010571.

[7] J. M. Haynes, "Basic spirometry testing and interpretation for the primary care provider," Can. J. Respir. Ther., vol. 54, no. 4, pp. 92– 98, 2018, doi: 10.29390/cjrt-2018-017.

[8] A. Kaur, C. V. Kalyani, and Kusum K, "Effect of Incentive Spirometry on Recovery of Post-Operative Patients: Pre Experimental Study," J. Nurs. Pract., vol. 3, no. 2, pp. 220–225, 2020, doi: 10.30994/jnp.v3i2.90..

[9] W. Y. Leong et al., "Reference equations for evaluation of spirometry function tests in South Asia, and among South Asians

living in other countries," Eur. Respir. J., vol. 60, no. 6, 2022, doi: 10.1183/13993003.02962-2021.

[10] B. Knox-Brown, O. Mulhern, and A. F. S. Amaral, "Spirometry parameters used to define small airways obstruction in population- based studies: Systematic review protocol," BMJ Open, vol. 11, no. 10, pp. 1–5, 2021, doi: 10.1136/bmjopen-2021-052931.

[11] Lia andriani, Priyambada Cahya Nugraha, and Sari Lutfiah, "Portable Spirometer for Measuring Lung Function Health (FVC and FEV1)," J. Electron. Electromed. Eng. Med. Informatics, vol. 1, no. 1, pp. 16–20, Jul. 2019, doi: 10.35882/jeeemi.v1i1.4.

[12] L. M. Li Kharis, A. Pudji, and P. C. Nugraha, "Development Portable Spirometer using MPXV7002DP Sensor and TFT Display for Lung Disease Detection.," Indones. J. Electron. Electromed. Eng. Med. informatics, vol. 2, no. 3, pp. 122–129, Nov. 2020, doi: 10.35882/ijeeemi.v2i3.3.

[13] S. N. Ibrahim, A. Z. Jusoh, N. A. Malik, and S. Mazalan, "Development of portable digital spirometer using NI sbRIO," in 2017 IEEE 4th International Conference on Smart Instrumentation, Measurement and Application (ICSIMA), Nov. 2017, vol. 1, no. January, pp. 1–4, doi: 10.1109/ICSIMA.2017.8311987.

[14] A. Panahi, A. Hassanzadeh, and A. Moulavi, "Design of a low cost, double triangle, piezoelectric sensor for respiratory monitoring applications," Sens. Bio-Sensing Res., vol. 30, p. 100378, Dec. 2020, doi: 10.1016/j.sbsr.2020.100378.

[15] S. Gupta, P. Chang, N. Anyigbo, and A. Sabharwal, "mobileSpiro," in Proceedings of the First ACM Workshop on Mobile Systems, Applications, and Services for Healthcare - mHealthSys '11, 2011, p. 1, doi: 10.1145/2064942.2064944.

[16] Y. S. Parihar, "Internet of Things and NodeMCU," Jetir, vol. 6, no. 6, pp. 1085–1088, 2019.

[17] P. H. Quanjer, G. L. Hall, S. Stanojevic, T. J. Cole, and J. Stocks, "Age- and height-based prediction bias in spirometry reference equations," Eur. Respir. J., vol. 40, no. 1, pp. 190–197, 2012, doi: 10.1183/09031936.00161011.

[18] I. Satia et al., "Exercise-induced bronchoconstriction and bronchodilation: Investigating the effects of age, sex, airflowlimitation and FEV1," Eur. Respir. J., vol. 58, no. 2, pp. 1–10, 2021, doi: 10.1183/13993003.04026-2020.

[19] M. F. Lutfi, "The physiological basis and clinical significance of lung volume measurements," Multidiscip. Respir. Med., vol. 12, no. 1, p. 3, Dec. 2017, doi: 10.1186/s40248-017-0084-5.

[20] A. Maier, A. Sharp, and V. Yuriy, "Comparative Analysis and Practical Implementation of the ESP32 Microcontroller Module for the Internet of Things," 2017 Internet Technol. Appl., pp. 143–148, 2014.

[21] Andreas, C. R. Aldawira, H. W. Putra, N. Hanafiah, S. Surjarwo, and A. Wibisurya, "Door security system for home monitoring based on ESp32," Procedia Comput. Sci., vol. 157, pp. 673–682, 2019, doi: 10.1016/j.procs.2019.08.218.

[22] A. F. Pauzi and M. Z. Hasan, "Development of IoT Based Weather Reporting System," IOP Conf. Ser. Mater. Sci. Eng., vol. 917, no. 1, 2020, doi: 10.1088/1757-899X/917/1/012032.

[23] M. R. Syarlisjiswan, Sukarmin, and D. Wahyuningsih, "The development of e-modules using Kodular software with problem-based learning models in momentum and impulse material," IOP Conf. Ser. Earth Environ. Sci., vol. 1796, no. 1, 2021, doi: 10.1088/1742-6596/1796/1/012078.

[24] K. Gupta, N. Jiwani, M. H. U. Sharif, M. A. Mohammed, and N. Afreen, "Smart Door Locking System Using IoT," 2022 Int. Conf. Adv. Comput. Commun. Mater. ICACCM 2022, no. May, pp. 3090– 3094, 2022, doi: 10.1109/ICACCM56405.2022.10009534.

[25] L. R. Camargo, J. R. Flórez, and O. D. Hurtado, "Kodular: A Tool For Teaching Programming And Microcontrollers," J. Lang. Linguist. Stud., vol. 18, no. 4, pp. 1186–1196, 2022, [Online]. Available: www.jlls.orgorcid:https://orcid.org/0000-0003-3483-1884ORCID:https://orcid.org/0000-0002-0653-0577ORCID:https://orcid.org/0000-0002-4155-4515