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Research Article

Blood Oxygen Saturation and Pulse Rate Comparatives Measures with Wrist Smartwatch and Oximeter Monitoring

José Luis Mosso Vázquez*

Hospital General y Regional No. 25, IMSSD, School of Medicine, Universidad Panamericana, Mexico City, Mexico

***Corresponding Author:** José Luis Mosso Vázquez, Hospital General y Regional No. 25, IMSSD, School of Medicine, Universidad Panamericana, Mexico City, Mexico.

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Abstract

Goal: We present 145 comparative statistical measures monitoring blood oxygen saturation BOS and pulse rate PR, monitoring with wrist smartwatch and oximeter in 145 randomized surgical outpatients 16 months after Mexican pandemic started.

Method: We set up wrist smartwatch on the right wrist and oximeter in the right index to monitoring PR and BOS in 145 randomized patients during examination in a tertiary Hospital at the Mexican Social Security in Mexico City.

Results: Remarkable results show a great difference between blood oxygen saturation measured by wrist smartwatch and oximeter because oximeter measured with large rank and smartwatch a short rank demonstrated with standard deviation and line regression in statistical analysis.

Conclusion: Internet of Medical Things is a potential technology in hospitals, homes and much more in global pandemic. With our results we demonstrate a great different result among two wearable devices. Physicians most choose the best brand carefully to make the best medical decision for patients.

Keywords: Internet of Medical Things; IoMT; Wrist Smart Watch; Oximeter

Introduction

Vishnu explains, the development of smart sensors, smart devices, advanced lightweight communication protocols made the possibility of interconnecting medical things to monitor biomedical signals and diagnose the diseases of patients without human intervention and termed as Internet of Medical Things (IoMT). An IoMT platforms is a smart system mainly comprises of sensors and electronic circuits to acquire biomedical signals from a patient, processing unit to process the biomedical signals, a network device to transmit the biomedical data over a network a temporary or permanent storage unit, a visualization platform with artificial intelligence schemes to take decision according to the convenience of physician [1]. Guo implemented a wearable blood oxygen pulse rate monitoring system to analyze data and display the results on a mobile phone [2]. Wearable blood oxygen systems development is, Xue designed an eat clip-type oximeter powered by solar energy. Li designed the traditional oximeter and sport bracelet. Chen designed the neonatal blood oxygen saturation monitor which is based on the reflective measurement method. Watthanawisuth designed a blood monitoring system-based ZigBee wireless sensor network. Nuria and other researchers have developed a blood oxygen monitoring system-based Bluetooth which is able to detect

sleep apnea from the blood oxygen signals [2]. IoMT are used in many medical and surgical areas with excellent help to physicians [2-7].

Methodology

145 randomized outpatients with surgical diseases were examinate in medical office at tertiary regional hospital number 25 of the IMSS in the east of Mexico City) Iztapalapa and Netzahualcoyotl counties in the period of May 22 to June 13, 2021. Patients returned to surgical consultation after 16 months when SARS 2, Covid - 19 global pandemic started in Mexico. They return to follow up the treatment with a new assessment with labs tests, medical images to integrate a medical history. With patient seat, surgeon measured directly the PR and BOS with Wrist Smartwatch and an oximeter, both placed on the right wrist and in the right index during examination. All patients used face mask and cleaned their hands with solution at 70% of alcohol solution before and after examination. Smartwatch and oximeter were cleaned after measure each. Statistical analysis was computing lineal regression of PR, BOS registered with Smartwatch and Oximeter lineal regression with excel is a software program created by Microsoft.

Results and Discussion

$n = 145$ patients, $\bar{x} = 49.69$ average age, 80 females (55.17%) and 65 males (44.8%). Standard Deviation: $\sigma = 2\%$ for wristwatch measures and $\sigma = 2.5\%$ for oximeter measures. We analyzed Pulse Rate and Oxygen Saturation with comparative line regressions and is remarkable the great difference between Oxygen Saturation measured by Wristwatch and Oximeter (See chart 2). Blood Oxygen Saturation measured by Wrist Smartwatch show measures concentration more than oximeter. In this comparative study, Wrist smartwatch demonstrate normal Oxygen saturation measures in 145 patients between 10 and 90 years of age. 3 patients did not participate and were excluded by carry artificial and larges nails that don´t permit set up oximeter on the right index finger. The most frequent surgical diagnosis is gallbladder stones (33 cases) followed by inguinal, umbilical and ventral hernias (40 cases) and Lipomas, the rest have other surgical pathologies. 45 patients (31%) had Sars-2 Covid-19. 73 patients, (50.34%) are vaccinated, 2 patients rejected vaccination because one feel fear to die and another one don´t believe in global pandemic virus. 3 patients are waiting vaccination appointment. Vaccines applied were as follows: Sputnik vaccines (53 cases), Sinovac (8 cases), Cansino (5 cases), Pfizer (5 cases) and Aztra Zeneca (1 case).

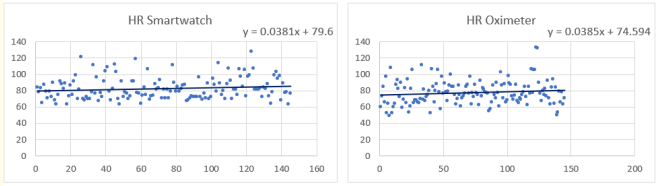

Chart 1: Pulse rate (PR) comparative measures line regression.

Chart 2: Blood oxygen saturation (OS) comparative measures line regression.

Conclusion

During global pandemic, Internet of Medical Things, support so hard physicians, families, Sars 2 Covid-19 outpatients and inpatients infected. The device more used was oximeter and thermometer in this pandemic. In this comparative study wrist smartwatch demonstrate small ranks measures in 145 patients while oximeter rank measures were larger as we can see in deviation standard and line regression in chart 2. In summary, blood oxygen saturation measures with smartwatch are not trustworthy. Blood oxygen saturation is an important measure medical parameter that involve respiratory and circulatory statement, which is a critical indicator in medical health monitoring, that is the reason that physician most choose carefully the best device to offer the best medical assessment and give the better treatment for patients. Up today IoMT represent a potential not invasive technology easy to use, easy to install, low cost. Comparative measures with different IoMD brands could be an interesting research in the future.

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