Novel Method of Monitoring Chronic Kidney and Other Renal Diseases using Colorimetric Test Strip Sensor and IoT Enhancement

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Chronic Kidney Disease (CKD) is a condition characterized as a gradual loss of kidney function over time. CKD and other renal diseases are the cause of approximately 1.2 million deaths worldwide making it the 12th most common cause of death; thus, making routine diagnostics and continual monitoring prudent. Currently, initial tests and procedures to identify and evaluate patients with CKD is done by a blood and/or urine test. The most common form of monitoring is a blood albumin to creatinine ratio (ACR) test. To complete the test, a patient must go to a hospital and have their blood drawn. The blood will be tested at the hospital or sent to a lab. This can take up to a day or more. Another method is the collecting urine for a 24+ hour period, which is not expeditious for results but is less intrusive for the patient. However, this method requires the patient to collect multiple samples of urine, document those samples accurately, keep it refrigerated, prepare it for shipping and any mistakes could lead to a miscommunication error. Due to these factors I have created a device that uses an Arduino microcontroller (Arduino Uno) that is connected to a TCS34725 Red Green Blue (RGB) color sensor to digitally read the color of a urine test strip after it has been dipped by the patient. The collected points quantitively correlate to a specific value Ex. (R: 81,G: 78, B:77 -> 80 mg/L) of three given parameters; amount of urine albumin, urine pH, and urine specific gravity (SG), which can then be sent to a web server that could be viewed by any qualified specialist. This could put an end to timely and expensive doctor’s office visits and is substantially cheaper and less intrusive than an ACR.

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