

# 25. BÖLÜM

## UZAKTAN HASTA BAKIM TEKNOLOJİLERİ



Zeynep KIZILCIK ÖZKAN<sup>1</sup>  
Figen DIĞIN<sup>2</sup>

### UZAKTAN HASTA BAKIMI

Uzaktan hasta bakım/takibi (UHT); hasta hakkında toplanan verilerin ve görüntülerin gerçek zamanlı bir şekilde kablosuz olarak sağlık kuruluşundaki personele iletilmesine fırsat sağlayan bir stratejidir <sup>(1)</sup>. UHT yaklaşımının ilk basamağında hastalar yer almaktadır. UHT, özellikle yaşlı, yenidoğan, kronik hastalığı olan, mobilite problemi yaşayan, cerrahi girişim uygulanan hastaların kendi yaşam ortamlarında özgür bir şekilde izlenmelerine imkan sunmaktadır <sup>(1)</sup>. Hastaya ait veriler yatarak tedavi edilen bireylerde hastane ortamında ve diğer bireyler için yaşanılan ortamda elde edilebilmektedir <sup>(2)</sup>. Hasta verilerini cihazlar toplamaktadır. Cihazlar; elbise, kemer, bileklik, yüzük, aksesuar, kulaklık, saat, gözlük, ayakkabı veya tshirt şeklinde giyilebilir veya sensörlerle (algılayıcı) donatılmış eşyalar (yatak) şeklinde olabilmekte iken bazı cihazlar vücut içine (yutulabilir) ya da yaşanılan alana (ev) yerleştirilebilen sensörler ile donatılmış olabilmektedirler. Veri toplayıcı cihazlar invaziv (pacemaker vb.) ya da noninvaziv (akselerometre vb.) olarak yerleştirilebilmekte ve taşınabilmektedir <sup>(3)</sup>. Bu teknolojik cihazlar kullanılarak hastanın gerçek zamanlı izlenmesi mümkündür <sup>(4)</sup>. Sensörler; düşük maliyetli, akıllı, kendi aralarında iletişim sağlayan, küçük boyutlu ve enerji kullanımı az olan cihazlardır <sup>(5)</sup>. Taşınabilir hasta izleme üniteleri ya da giyilebilir cihazlarla

<sup>1</sup> Dr., Trakya Üniversitesi, Sağlık Bilimleri Fakültesi, Hemşirelik Bölümü, zeynepkizilcik26@hotmail.com.tr

<sup>2</sup> Dr. Öğr. Üyesi, Kırklareli Üniversitesi, Sağlık Bilimleri Fakültesi, Hemşirelik Bölümü, fgndgn2013@gmail.com, kurum

lanmakta olan öncü klinisyen ve akademisyen hemşirelerin bu konuda yol gösterici olarak aktif rol alması gerekmektedir.

## KAYNAKLAR

1. Malasinghe LP, Ramzan N, Dahal K, et al. Remote patient monitoring: a comprehensive study. *J Ambient Intell Humaniz Comput.* 2019;10:57–76. Doi 10.1007/s12652-017-0598-x
2. Azoui A, Idoughi D, Abdelouhab KA. Design of remote pervasive health monitoring system based on cloud computing and SOA. 2020 2nd International Workshop on Human-Centric Smart Environments for Health and Well-being. Doi: 10.1109/IHSH51661.2021.9378745. p:48-53.
3. Bhatia A, Maddox TM, Remote patient monitoring in heart failure: factors for clinical efficacy. *Int J Heart Fail.* 2021;3(1):31-50.
4. Ali F, El-Sappagh S, Islam SMR, et al. An intelligent healthcare monitoring framework using wearable sensors and social networking data. *Future Gener Comput Syst.* 2021;114:23–43.
5. Türker GF, Tarımer İ. Türkiye’de kablosuz algılayıcı ağlar ile yapılan teknolojik uygulamalar üzerine bir inceleme. Akademik Bilişim’11 - XIII. Akademik Bilişim Konferansı Bildirileri. 2 - 4 Şubat 2011 İnönü Üniversitesi, Malatya, Türkiye.
6. Frank R. What are ingestible sensors?. 2017. (15.05.2021 tarihinde <https://www.sensortips.com/featured/what-are-ingestible-sensors/> adresinden ulaşılmıştır).
7. Statista Research Department. (30/05/2021 tarihinde <https://www.statista.com/statistics/471264/iot-number-of-connected-devices-worldwide/> adresinden ulaşılmıştır).
8. Haoyu L, Jianxing L, Arunkumar N, et al. An IoMT cloud-based real time sleep apnea detection scheme by using the SpO2 estimation supported by heart rate variability. *Future Gener Comput Syst.* 2019;98:69–77.
9. Hafezi H, Robertson TL, Moon GD, et al. An Ingestible sensor for measuring medication adherence. *IEEE Transactions on Biomedical Engineering,* 2015;62(1):99-109. Doi: 10.1109/TBME.2014.2341272
10. Kadhim KT, Alsahlany AM, Wadi SM, et al. An overview of patient’s health status monitoring system based on internet of things (IoT). *Wirel Pers Commun.* 2020;114:2235–2262.
11. Eisenberger U, Wüthrich R, Bock A, et al. 2013 Medication adherence assessment: high accuracy of the new ingestible sensor system in kidney transplants. *Transplantation.* 2013;96(3):245-250.
12. Parkes E, Shakespeare J, Bishopp A, et al. Symptomology versus physiology: trialling long term non-invasive ventilation in a motor neurone disease clinical cohort. *Thorax.* 2019;74:Suppl. 2, A106-A107.
13. Mcdoweel G, Toellner H, Macfarlane D, et al. 2-way remote monitoring in adaptive mode allows effective and realistic provision of home non-invasive ventilation (NIV) to patients with severe COPD. *Eur Respir J.* 2018;52:Suppl. 62, PA1668. Doi: 10.1183/13993003.congress-2018.PA1668
14. Delrobaei M, Memar S, Pieterman M, et al. Towards remote monitoring of parkinson’s disease tremor using wearable motion capture systems. *J Neurol Sci.* 2018;384:38-45.
15. Silva de Lima AL, Smits T, Darweesh SKL, et al. Home-based monitoring of falls using wearable sensors in parkinson’s disease. *J Mov Disorders.* 2020;35(1):109-115. Doi: 10.1002/mds.27830.
16. Kirkland EB, Marsden J, Zhang J, et al. Remote patient monitoring sustains reductions of hemoglobin A1c in underserved patients to 12 months. *Prim Care Diabetes.* 2021;15: 459-463.
17. Yuan M, Das R, McGlynn E, et al. Wireless communication and power harvesting in wearable contact lens sensors. *IEEE Sensors Journal,* 2021. DOI: 10.1109/jsen.2021.3055077

18. Farrús M, Codina-Filbà J, Escudero J. Acoustic and prosodic information for home monitoring of bipolar disorder. *Health Informatics J.* 2021;1-13. Doi: 10.1177/1460458220972755
19. Kadhum AA, Al-Libawy H, Hussein EA. An accurate fall detection system for the elderly people using smartphone inertial sensors. *Journal of Physics: Conference Series,* 2020;1530:012102. Doi:10.1088/1742-6596/1530/1/012102
20. Nooruddin S, Islam M, Sharna FA. An IoT based device-type invariant fall detection system. *Internet of Things.* 2020;9:100130.
21. Joury A, Bob-Manuel T, Sanchez A, et al. Leadless and wireless cardiac devices: the next frontier in remote patient monitoring. *Curr Probl Cardiol.* 2021;46:100800
22. Paganelli AI, Velmovitsky PE, Miranda P, et al. A conceptual IoT-based early-warning architecture for remote monitoring of COVID-19 patients in wards and at home. *Internet of Things,* 2021.
23. Morgan A, Balachandran M, Do D, et al. Remote monitoring of patients with covid-19: Design, implementation, and outcomes of the first 3,000 patients in COVID Watch. *NEJM Catalyst.* 2020;1(4).
24. Chau NVV, Hai HB, Greeff H, et al. Wearable remote monitoring for patients with COVID-19 in low-resource settings: case study. *BMJ Innovations,* 2021;7:12–15. doi:10.1136/bmjinnov-2021-000706
25. Hoang ML, Carratu M, Paciello V, et al. Body temperature—indoor condition monitor and activity recognition by MEMS accelerometer based on IoT-Alert system for people in quarantine due to COVID-19. *Sensors,* 2021;21(2313):1-19.
26. Garelli F, Rosales N, Fushimi E, et al. Remote glucose monitoring platform for multiple simultaneous patients at coronavirus disease 2019 intensive care units: case report including adults and children. *Diabetes Technol Ther.* 2021;23(5):1-3. Doi: 10.1089/dia.2020.0556 (Letter to the Editor).
27. Hakim A, Keliish A, Atabek U. Implications for the use of telehealth in surgical patients during the COVID-19 pandemic. *American J Surg.* 2020;220:48-49.
28. Singh R, Javid M, Haleem A, et al. Internet of Medical Things (IoMT) for orthopaedic in COVID-19 pandemic: Roles, challenges, and applications. *J Clin Orthop Trauma,* 2020;11:713-717.
29. Wang Y, Qiu Y, Ameri SK, et al. Low-cost, µm-thick, tape-free electronic tattoo sensors with minimized motion and sweat artifacts. *Npj Flex Electron,* 2018;2(6):1-7.
30. Faes L, Islam M, Bachmann LM, et al. False alarms and the positive predictive value of smartphone-based hyperacuity home monitoring for the progression of macular disease: a prospective cohort study. *Eye,* 2021;1-6.
31. Kuper T, Koughnett V, Ann J. Feasibility of post-operative mobile health monitoring among colorectal surgery patients. 2020. The University of Western Ontario. Master Thesis. <https://ir.lib.uwo.ca/etd/6928>
32. Runkle JD, Sugg MM, McCrory S, et al. Examining the feasibility of smart blood pressure home monitoring: advancing remote prenatal care in rural appalachia. *Telemedicine Reports.* 2021;2(1):125-134. Doi: 10.1089/tmr.2020.0021
33. Borel JC, Palot A, Patout M. Technological advances in home non-invasive v entilation monitoring: Reliability of data and effect on patient outcomes. *Respirology,* 2019;24:1143–1151. Doi: 10.1111/resp.13497
34. Swayamsiddha S, Mohanty C. Application of cognitive Internet of Medical Things for COVID-19 pandemic. *Diabetes Metabo Syndr.* 2020;14:911-915.
35. McGillion M, Ouellette C, Good A, et al. (2020). Postoperative remote automated monitoring and virtual hospital-to-home care system following cardiac and major vascular surgery: user testing study. *J Med Internet Res.* 2020; 22(3):e15548.

36. Ayyadurai P, Alkhwam H, Saad M, et al. An update on the CardioMEMS pulmonary artery pressure sensor. *Ther Adv Cardiovasc Dis.* 2019;13:1-11.
37. Kruizinga MD, Heide Nvd, Moll A, et al. Towards remote monitoring in pediatric care and clinical trials—tolerability, repeatability and reference values of candidate digital endpoints derived from physical activity, heart rate and sleep in healthy children. *PLoS ONE,* 2021;16(1):e0244877.
38. Oikonomidi T, Ravaud P, Cosson E, et al. Evaluation of patient willingness to adopt remote digital monitoring for diabetes management. *JAMA Network Open,* 2021;4(1):e2033115. Doi:10.1001/jamanetworkopen.2020.33115
39. Fan R, Andrew T. Perspective—challenges in developing wearable electrochemical sensors for longitudinal health monitoring. *J Electrochem Soc.* 2020;167:037542.
40. Peng B, Zhao F, Ping J, et al. Recent advances in nanomaterial-enabled wearable sensors: material synthesis, sensor design, and personal health monitoring. *Small,* 2020;16:2002681.
41. Frerichs I, Vogt B, Wacker J, et al. Multimodal remote chest monitoring system with wearable sensors: a validation study in healthy subjects. *Physiol Meas.* 2020;41:015006.
42. Muzny M, Henriksen A, Giordanengo A, et al. Wearable sensors with possibilities for data exchange: Analyzing status and needs of different actors in mobile health monitoring systems. *Int J Med Inform.* 2020;133:104017.
43. Grisot M, Kempton A, Hagen L, et al. Data-work for personalized care: Examining nurses' practices in remote monitoring of chronic patients. *Health Informatics J.* 2019;25(3):608–616. Doi: 10.1177/1460458219833110
44. Scalvini S, Comini L, Bernocchi P. How can multidisciplinary management with remote monitoring improve the outcome of patients with chronic cardiac diseases?, *Expert Rev Med Devices.* 2020;17(3):153-157. DOI:10.1080/17434440.2020.1720510.
45. Rutledge C, Pitts C, Poston R et al. NONPF Supports telehealth in nurse practitioner education. 2018:1-5. (22/06/2021 tarihinde [https://cdn.ymaws.com/www.nonpf.org/resource/resmgr/2018\\_Slate/Telehealth\\_Paper\\_2018.pdf](https://cdn.ymaws.com/www.nonpf.org/resource/resmgr/2018_Slate/Telehealth_Paper_2018.pdf) adresinden ulaşılmıştır).
46. Pepito JA, Locsin R. Can nurses remain relevant in a technologically advanced future?. *Int J Nurs Sci.* 2019;6(1): 106-110.
47. Chike-Harris KE. Telehealth education of nurse practitioner students. *J Nurse Pract.* 2021;17(3): 310-316.