

Review of Cybersecurity in the Radiology Department

Arthur Pangemanan

Abstract—This paper will review the cyber threat of modern medical device within the radiology department.

Index Terms—Cybersecurity, Security, Risk, Safety, Wireless, Medical devices.

I. INTRODUCTION

THE medical industry has change ever since the first computer were introduced. The healthcare technologies have the potential to extend, save and enhance the live of patients [1]. Furthermore, hospitals have witnessed a proliferation of networked medical equipment in the past decade. There is an emergent trend of connection medical equipment to the hospital network for easy accessibility and manageability. Recently, securing medical devices against cyberattacks or malware outbreaks and safeguarding protected health information (PHI) stored on devices or exchanged between a device and the provider's network is a growing challenge for clinical engineers and hospital information technology (IT) professional [2]. The number of high-profile public demonstrations of successful attacks on devices and medical networks have increased. Over the past few years, the question of inadequate clinical security has been gaining attention from both industry leaders and clinical practitioners.

II. BACKGROUND

A. History Of Medical Devices

Subsection text here.

B. Implantable Medical Devices

C. Electronic Health Records

III. CYBERSECURITY IN HEALTHCARE

IV. TYPES OF CYBER THREATS

V. FUTURE SECURITY CHALLENGES

The medical industry face many challenges [3]. [4]. [5]. [6]. [7]. [8]. [9]. [10]. [11]. [12]. [13]. [14]. [15]. [16]. [17]. [18]. [19]. [20]. [21]. [22]. [21]. [23].

VI. CONCLUSION

The conclusion goes here.

REFERENCES

- [1] L. Coventry and D. Branley, "Cybersecurity in healthcare: A narrative review of trends, threats and ways forward," *Maturitas*, vol. 113, pp. 48–52, 2018.
- [2] A. Wirth, "Cybercrimes pose growing threat to medical devices," *Biomedical instrumentation & technology*, vol. 45, no. 1, pp. 26–34, 2011.
- [3] J. Sametinger, J. Rozenblit, R. Lysecky, and P. Ott, "Security challenges for medical devices," *Commun. ACM*, vol. 58, no. 4, pp. 74–82, Mar. 2015. [Online]. Available: <http://doi.acm.org/10.1145/2667218>
- [4] P. A. Williams and A. J. Woodward, "Cybersecurity vulnerabilities in medical devices: a complex environment and multifaceted problem," *Medical Devices (Auckland, NZ)*, vol. 8, p. 305, 2015.
- [5] V. Moses and I. Korah, "Lack of security of networked medical equipment in radiology," *American Journal of Roentgenology*, vol. 204, no. 2, pp. 343–353, 2015.
- [6] A. Ferrara, "Cybersecurity in medical imaging," *Radiologic technology*, vol. 90, no. 6, pp. 563–575, 2019.
- [7] S. Murphy, "Is cybersecurity possible in healthcare," *National Cybersecurity Institute Journal*, vol. 1, no. 3, pp. 49–63, 2015.
- [8] M. Stites and O. S. Panykh, "How secure is your radiology department? mapping digital radiology adoption and security worldwide," *American Journal of Roentgenology*, vol. 206, no. 4, pp. 797–804, 2016.
- [9] Z. Wang, P. Ma, Y. Chi, and J. Zhang, "Medical devices are at risk: Information security on diagnostic imaging system," pp. 2309–2311, 2018. [Online]. Available: <http://doi.acm.org/10.1145/3243734.3278513>
- [10] A. Ray and R. Cleaveland, "An analysis method for medical device security," pp. 16:1–16:2, 2014. [Online]. Available: <http://doi.acm.org/10.1145/2600176.2600192>
- [11] P. Gerard, N. Kapadia, J. Acharya, P. T. Chang, and Z. Lefkowitz, "Cybersecurity in radiology: access of public hot spots and public wi-fi and prevention of cybercrimes and hipaa violations," *American Journal of Roentgenology*, vol. 201, no. 6, pp. 1186–1189, 2013.
- [12] T. Mahler, N. Nissim, E. Shalom, I. Goldenberg, G. Hassman, A. Makori, I. Kochav, Y. Elovici, and Y. Shahar, "Know your enemy: Characteristics of cyber-attacks on medical imaging devices," *arXiv preprint arXiv:1801.05583*, 2018.
- [13] P. Ma, Z. Wang, X. Zou, J. Zhang, Q. Liu, X. Lyu, and W. Wang, "Medical imaging device security: An exploratory study," *arXiv preprint arXiv:1904.00224*, 2019.
- [14] M. Busdicker and P. Upendra, "The role of healthcare technology management in facilitating medical device cybersecurity," *Biomedical instrumentation & technology*, vol. 51, no. s6, pp. 19–25, 2017.
- [15] G. Martin, P. Martin, C. Hankin, A. Darzi, and J. Kinross, "Cybersecurity and healthcare: how safe are we?" *Bmj*, vol. 358, p. j3179, 2017.
- [16] M. Marwan, A. Kartit, and H. Ouahmane, "Design a secure framework for cloud-based medical image storage," pp. 7:1–7:6, 2017. [Online]. Available: <http://doi.acm.org/10.1145/3090354.3090361>
- [17] D. Foo Kune, K. Venkatasubramanian, E. Vasserman, I. Lee, and Y. Kim, "Toward a safe integrated clinical environment: A communication security perspective," in *Proceedings of the 2012 ACM Workshop on Medical Communication Systems*, ser. MedCOMM '12. New York, NY, USA: ACM, 2012, pp. 7–12. [Online]. Available: <http://doi.acm.org/10.1145/2342536.2342540>
- [18] H. Almohri, L. Cheng, D. D. Yao, and H. Alemzadeh, "On threat modeling and mitigation of medical cyber-physical systems," in *Proceedings of the Second IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies*, ser. CHASE '17. Piscataway, NJ, USA: IEEE Press, 2017, pp. 114–119. [Online]. Available: <https://doi.org/10.1109/CHASE.2017.69>
- [19] C. TK, "Inside risks controlling for cybersecurity risks of medical device software," *Communications of the ACM*, vol. 56, no. 10, 2013.

- [20] K. Fu and J. Blum, "Controlling for cybersecurity risks of medical device software," *Biomedical instrumentation & technology*, vol. 48, no. s1, pp. 38–41, 2014.
- [21] G. Tanev, P. Tzolov, and R. Apiafi, "A value blueprint approach to cybersecurity in networked medical devices," *Technology Innovation Management Review*, vol. 5, no. 6, 2015.
- [22] J. Sametinger, J. Rozenblit, R. Lysecky, and P. Ott, "Security challenges for medical devices," *Commun. ACM*, vol. 58, no. 4, pp. 74–82, Mar. 2015. [Online]. Available: <http://doi.acm.org/10.1145/2667218>
- [23] C. J. Lewis, "Cybersecurity in healthcare," Ph.D. dissertation, 2014, copyright - Database copyright ProQuest LLC; ProQuest does not claim copyright in the individual underlying works; Last updated - 2016-06-05.