# Scopus

## **Documents**

Hakiem, N.<sup>a</sup>, Afrizal, S.H.<sup>b</sup>, Setiadi, Y.<sup>c</sup>, Albab, H.S.<sup>a</sup>, Riasetiawan, M.<sup>d</sup>, Zulhuda, S.<sup>e</sup>

Security and Privacy Policy Assessment in Mobile Health Applications: A Literature Review (2024) *Journal of System and Management Sciences*, 14 (2), pp. 355-371.

DOI: 10.33168/JSMS.2024.0222

## **Abstract**

Currently, the availability of mobile health (mHealth) applications is growing, implying the development and effectiveness of healthcare facilities. However, the sensitive medical information potentially intrudes into the privacy and security of users which has not been acknowledged by the user. The lack of guidance regarding privacy policy assessment causes concern with the development of privacy policy requirements based on privacy and security dimensions. This study objectives to identify the requirements of the privacy policy in mHealth applications. A narrative review has been conducted using keywords to find related open-source literature published from 2015 to 2022 from Science Direct, PMC, and PubMed databases to identify the privacy and security assessments based on the perspective of mHealth App research. A total of 17 articles were reviewed using the keywords "privacy policy" AND "privacy" AND "security" AND "mobile health". Three major requirements were found related to privacy and security frameworks namely consistency and transparency, data management and processing, and interconnected-data arrangement. Consistency and transparency involve clear processes, data types, legal safeguards, access provisions, data sharing transparency, and data quality maintenance. Data management and processing require disclosure mechanisms, robust technical security measures, and protocols for vulnerable users. Lastly, an interconnected data arrangement should include data arrangement identification, data sharing policies, and data interconnection procedures. © 2024, Success Culture Press. All rights reserved.

# **Author Keywords**

digital health; mobile health Apps; privacy and security assessment; privacy policy

## References

- Alfawzan, N., Christen, M., Spitale, G., Biller-Andorno, N.
   Privacy, Data Sharing, and Data Security Policies of Women's mHealth Apps: Scoping Review and Content Analysis

   (2022) JMIR MHealth and UHealth, 10 (5), p. e33735.
- (2022) The App Evaluation Model,
- Aswandi, R., Muchsin, P. R., Sultan, M.
   (2020) Perlindungan Data dan Informasi Pribadi Melalui Indonesian Data Protection System (IDPS), 3 (2), pp. 167-190.
- Bachiri, M., Idri, A., Fernández-Alemán, J. L., Toval, A.
   Mobile personal health records for pregnancy monitoring functionalities: Analysis and potential
   (2016) Computer Methods and Programs in Biomedicine, 134, pp. 121-135.
- Bally, E. L. S., Cesuroglu, T.
   Toward Integration of mHealth in Primary Care in the Netherlands: A Qualitative Analysis of Stakeholder Perspectives (2020) Frontiers in Public Health, 7.
- Benjumea, J., Ropero, J., Rivera-Romero, O., Dorronzoro-Zubiete, E., Carrasco, A.
   Assessment of the fairness of privacy policies of mobile health apps: Scale

<sup>&</sup>lt;sup>a</sup> Faculty of Science and Technology, Universitas Islam Negeri Syarif Hidayatullah, Jakarta, Indonesia

<sup>&</sup>lt;sup>b</sup> Faculty of Health Sciences and Technology, Universitas Binawan, Jakarta, Indonesia

<sup>&</sup>lt;sup>c</sup> Internal Control Audit, Universitas Islam Negeri Syarif Hidayatullah, Jakarta, Indonesia

<sup>&</sup>lt;sup>d</sup> Faculty of Mathematics and Natural Sciences, Universitas Gadjah Mada, Yogyakarta, Indonesia

<sup>&</sup>lt;sup>e</sup> Ahmad Ibrahim Kulliyyah of Laws, International Islamic University Malaysia, Kuala Lumpur, Malaysia

development and evaluation in cancer apps (2020) *JMIR MHealth and UHealth*, 8 (7), pp. 1-20.

Bining, M., Wasserman, S., Brahim, L. O., Belzile, E., Magalhaes, M., Lambert, S. D.
 An Evaluation of Publicly Available Smartphone Apps to Support Unpaid Cancer Caregivers

(2022) Journal of Pain and Symptom Management, 63 (3), pp. 430-439.

- Bookert, N., Bondurant, W., Anwar, M.
   Data practices of internet of medical things: A look from privacy policy perspectives (2022) Smart Health, 26, p. 100342.
   (September)
- (2021) HIPAA Basics for Providers: Privacy, Security, & Breach Notification Rules, pp. 1-11. (Issue May, –). Medicare Learning Network
- Cornet, V. P., Holden, R. J. **Systematic review of smartphone-based passive sensing for health and wellbeing** (2018) *Journal of Biomedical Informatics*, 77, pp. 120-132.
- Proposed Rule Standards for Privacy of Individually Identifiable Health Information (1999) Federal Register, 64.
- Dinh-Le, C., Chuang, R., Chokshi, S., Mann, D.
   Wearable health technology and electronic health record integration: Scoping review and future directions

   (2019) JMIR MHealth and UHealth, 7 (9).
- Mbunge, Elliot, Batani, John, Gaobotse, Goabaone, Muchemwa, Benhildah
   Virtual healthcare services and digital health technologies deployed during coronavirus disease 2019 (COVID-19) pandemic in South Africa: a systematic review (2022) Global Health Journal,
- Flors-Sidro, J. J., Househ, M., Abd-Alrazaq, A., Vidal-Alaball, J., Fernandez-Luque, L., Luis Sanchez-Bocanegra, C.
   Analysis of diabetes apps to assess privacy-related permissions: systematic search of apps
   (2021) JMIR Diabetes, 6 (1), pp. 1-14.
- Hatamian, M., Wairimu, S., Momen, N., Fritsch, L.
   A privacy and security analysis of early-deployed COVID-19 contact tracing Android apps
   (2021) Empirical Software Engineering, 26 (3).
   Empirical Software Engineering
- Hendricks-Sturrup, R.
   Pulse Oximeter App Privacy Policies during COVID-19: Scoping Assessment (2022) JMIR MHealth and UHealth, 10 (1), pp. 1-10.
- Huckvale, K., Torous, J., Larsen, M. E.
   Assessment of the Data Sharing and Privacy Practices of Smartphone Apps for Depression and Smoking Cessation (2019) JAMA Network Open, 2 (4), pp. 1-10.
- Hughson, J. A. P., Oliver Daly, J., Woodward-Kron, R., Hajek, J., Story, D.
   The rise of pregnancy apps and the implications for culturally and linguistically diverse women: Narrative review
   (2018) JMIR mHealth and uHealth, 6 (11).

• Hussain, M., Zaidan, A. A., Zidan, B. B., Iqbal, S., Ahmed, M. M., Albahri, O. S., Albahri, A.

Conceptual framework for the security of mobile health applications on Android platform

(2018) Telematics and Informatics, 35 (5), pp. 1335-1354.

- (2007) Access to Information Act and Privacy Act: Annual Report 2006-2007, Government of Canada
- Lagan, S., Sandler, L., Torous, J.

Evaluating evaluation frameworks: A scoping review of frameworks for assessing health apps

(2021) BMJ Open, 11 (3).

- Lamonica, H. M., Roberts, A. E., Lee, G. Y., Davenport, T. A., Hickie, I. B. Privacy practices of health information technologies: Privacy policy risk assessment study and proposed guidelines (2021) Journal of Medical Internet Research, 23 (9).
- Levine, D. M., Co, Z., Newmark, L. P., Groisser, A. R., Holmgren, A. J., Haas, J. S., Bates, D. W.

Design and testing of a mobile health application rating tool (2020) Npj Digital Medicine, 3 (1), pp. 1-8.

Liu, Q., Zhang, T.

Deep learning technology of computer network security detection based on artificial intelligence

(2023) Computers and Electrical Engineering, 110.

Mia, M. R., Shahriar, H., Valero, M., Sakib, N., Saha, B., Barek, M. A., Faruk, M. J. H., Ahamed, S. I.

A comparative study on HIPAA technical safeguards assessment of android mHealth applications

(2022) Smart Health, 26, p. 100349. (September)

• Minen, M. T., Stieglitz, E. J., Sciortino, R., Torous, J.

Privacy Issues in Smartphone Applications: An Analysis of Headache/Migraine **Applications** 

(2018) Headache, 58 (7), pp. 1014-1027.

- Mnjama, J., Foster, G., Irwin, B.
  - A privacy and security threat assessment framework for consumer health wearables (2017) 2017 Information Security for South Africa-Proceedings of the 2017 ISSA Conference, pp. 66-73.

2018-January

- Morera, E. P., de la Torre Díez, I., Garcia-Zapirain, B., López-Coronado, M., Arambarri, J. Security Recommendations for mHealth Apps: Elaboration of a Developer's Guide (2016) Journal of Medical Systems, 40 (6).
- Nass, S. J., Levit, L. A., Gostin, L. O.

Beyond the HIPAA Privacy Rule: Enhancing Privacy, Improving Health Through Research

(2009) National Academies,

National Academies Press (US)

 NISTIR 8062: An introduction to privacy engineering and risk management in federal systems

(2017) NIST Interagency Report, p. 49.

- (2020) NIST Privacy Framework, January 16, 2020
- Ni, Z., Wang, Y., Qian, Y.
   Privacy Policy Compliance of Chronic Disease Management Apps in China: Scale Development and Content Evaluation
   (2021) JMIR MHealth and UHealth, 9 (1), p. e23409.
- Nurgalieva, L., O'Callaghan, D., Doherty, G.
   Security and Privacy of mHealth Applications: A Scoping Review (2020) IEEE Access, 8, pp. 104247-104268.
- Pang, P. C. I., McKay, D., Chang, S., Chen, Q., Zhang, X., Cui, L.
   Privacy concerns of the Australian My Health Record: Implications for other large-scale opt-out personal health records

   (2020) Information Processing & Management, 57 (6), p. 102364.
- Parker, L., Halter, V., Karliychuk, T., Grundy, Q.
   How private is your mental health app data? An empirical study of mental health app privacy policies and practices
   (2019) International Journal of Law and Psychiatry, 64, pp. 198-204.
   (November 2018)
- Paul, N., Tesfay, W. B., Kipker, D. K., Stelter, M., Pape, S.
   Assessing privacy policies of internet of things services
   (2018) IFIP Advances in Information and Communication Technology, 529, pp. 156-169.
- Robillard, J. M., Feng, T. L., Sporn, A. B., Lai, J. A., Lo, C., Ta, M., Nadler, R.
   Availability, readability, and content of privacy policies and terms of agreements of mental health apps

   (2019) Internet Interventions, 17, p. 100243.
   (March)
- Rosenfeld, L., Torous, J., Vahia, I. V.
   Data Security and Privacy in Apps for Dementia: An Analysis of Existing Privacy Policies
   (2017) American Journal of Geriatric Psychiatry, 25 (8), pp. 873-877.
- Rudnytskyi, V., Korchenko, O., Lada, N., Ziubina, R., Wieclaw, L., Hamera, L.
   Cryptographic encoding in modern symmetric and asymmetric encryption (2022) Procedia Computer Science, 207, pp. 54-63.
- Ruotsalainen, P., Blobel, B.
   Health information systems in the digital health ecosystem— problems and solutions for ethics, trust and privacy
   (2020) International Journal of Environmental Research and Public Health, 17 (9), pp. 1-16.
- Russell, C. R., Zigan, C., Wozniak, K., Soni, K., Hill Gallant, K. M., Friedman, A. N. A Systematic Review and Qualitative Analysis of Existing Dietary Mobile Applications for People With Chronic Kidney Disease (2021) Journal of Renal Nutrition, 32 (4), pp. 382-388.
- Shore, J. H., Yellowlees, P., Caudill, R., Johnston, B., Turvey, C., Mishkind, M., Krupinski, E., Hilty, D.
   Best Practices in Videoconferencing-Based Telemental Health April 2018
   (2018) Telemedicine and E-Health, 24 (11), pp. 827-832.
- Soenen, P., Academy, Q. A.
   (2019) Privacy Information Management with ISO 27701 Overview of the ISO 27701 Who should implement ISO 27701? GDPR certification ISO 27701-an extension to ISO

27001, pp. 1-17. May 2018

- Sunyaev, A., Dehling, T., Taylor, P. L., Mandl, K. D.
   Availability and quality of mobile health app privacy policies
   (2015) Journal of the American Medical Informatics Association, 22 (e1), pp. e28-e33.
- Tangari, G., Ikram, M., Ijaz, K., Kaafar, M. A., Berkovsky, S.
   Mobile health and privacy: Cross sectional study (2021) The BMJ, 373.
- Regulation (EU) 2016/679 of the European Parliament and of the Council on the protection of natural persons with regard to the processing of personal data on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)

(2016) Official Journal of the European Union,

- Xu, K., Zhang, W., Yan, Z.
  - A privacy-preserving mobile application recommender system based on trust evaluation

(2018) Journal of Computational Science, 26, pp. 87-107.

Yang, Z., Yang, M., Zhang, Y., Gu, G., Ning, P., Wang, X. S.
 AppIntent: Analyzing sensitive data transmission in Android for privacy leakage detection

(2013) Proceedings of the ACM Conference on Computer and Communications Security, pp. 1043-1054.

Yaqoob, T., Abbas, H., Shafqat, N.
 Integrated Security, Safety, and Privacy Risk Assessment Framework for Medical Devices

(2020) IEEE Journal of Biomedical and Health Informatics, 24 (6), pp. 1752-1761.

## **Correspondence Address**

Hakiem N.; Faculty of Science and Technology, Indonesia; email: hakiem@uinjkt.ac.id

Publisher: Success Culture Press

ISSN: 18166075

Language of Original Document: English Abbreviated Source Title: J. Syst. Manag. Sci.

2-s2.0-85185148108 **Document Type:** Article **Publication Stage:** Final

Source: Scopus



Copyright © 2024 Elsevier B.V. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

**RELX** Group™