Optimizing Patient Identity Management in Healthcare: Strategic Recommendations to Implement a Biometric Solution

Anaida Parrilla González
Advisor: Héctor J. Cruzado, PhD
Master of Engineering Management
Graduate Project EXPO, February, 2026

Abstract

This study assesses the viability of biometric identification in Puerto Rico hospitals using a literature review, case analyses, and surveys/interviews with patients and hospital staff. Findings show perceived inefficiency by 68% of respondents and increased errors during high demand periods, indicating that biometric systems could reduce identification errors, shorten wait times, and improve data security. A phased pilot implementation is recommended to ensure regulatory compliance.

Introduction

Biometric identification uses unique biological characteristics to verify identity and is widely applied in security and authentication systems. Despite growth, healthcare facilities still rely on traditional identifiers which are vulnerable to errors, duplication, and fraudulent misuse. Limited adoption of biometrics in healthcare has shown benefits in emergency scenarios, but broader implementation is constrained by system integration, privacy compliance, cost, and user challenges. This study is to develop strategic recommendations for implementing biometric identification in healthcare facilities in Puerto Rico to improve patient identification accuracy and operational efficiency.

Methodology

This study employed analytic research approach combining literature review, case analysis, and stakeholder data collection. An evaluation of scientific articles, cases of current implemented systems, legal, regulatory, and technical frameworks was conducted to contextualize biometric adoption in Puerto Rico. Interviews were conducted with medical and administrative staff to assed the viability, benefits, and concerns. Surveys of potential patients evaluated acceptance, trust, and willingness to adopt a biometric system. Quantitative data was analyzed to identify trends and significant factors influencing acceptance and implementation success. Additionally, qualitative data responses were examined to extract recurring benefits and concerns among participants. Findings were integrated to formulate a set of recommendations to implement biometric identification systems in Puerto Rican healthcare facilities addressing a practical, low risk, and regulation-aligned implementation.

Literature Review

Biometric identification relies on unique physiological characteristics to accurately verify individual identity, offering greater security than traditional identification methods [1], [2]. Its widespread use in everyday technologies, such as mobile device authentication, demonstrates reliability and accuracy across multiple areas [3]. In healthcare, biometric systems are increasingly explored to address patient misidentification, which is associated with medical errors, record duplication, and delays in care, particularly in emergency situations involving unidentified or unconscious patients [4].

Evidence suggests that biometric identification systems can achieve high accuracy with minimal errors while increasing the protection of electronic health records and reducing fraud [5]. Successful implementation cases, such as Geisinger Health in Pennsylvania, demonstrate the viability of integrating biometric identification with electronic health record (EHR) systems, improving operational efficiency and patient control over health data [6]. These implementations align with emerging patient-centered EHR models that highlight transparency, accessibility, and secure patient engagement [7].

Discussion of Survey Findings

Survey results indicate that most respondents are familiar with biometric technologies. As shown in Figure 1, 79% reported patient identification times exceeding five minutes, suggesting potential delays, which are particularly critical in emergency situations, and increased inefficiency during peak periods. Additionally, Figure 2 shows that 68% of respondents perceive the current identification process as imprecise, highlighting vulnerability to errors and reinforcing concerns about patient misidentification.

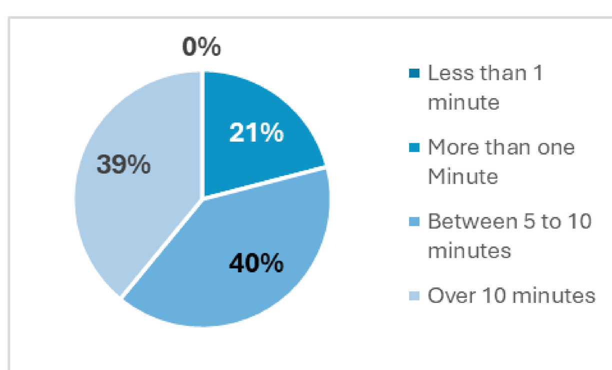

Figure 1
Time Perceived by Respondents Through the Actual Identification

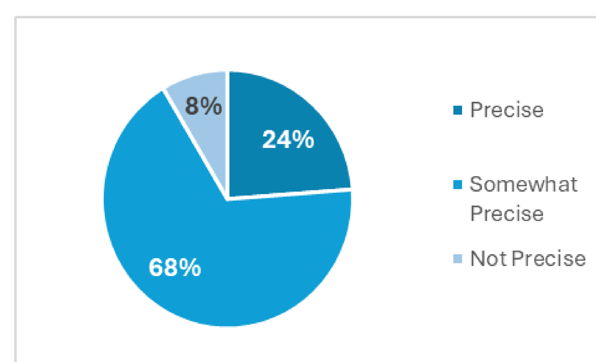

Figure 2
Experienced Precision of Actual Process by Respondents

As shown in Figure 3, 49% of respondents preferred biometric identification as an optional or complementary system rather than a full replacement, reflecting concerns related to trust, familiarity, and perceived risk. These results suggest that a hybrid or phased implementation approach may increase user trust, reduce resistance, and support operational continuity. Persistent concerns regarding biometric data security further highlight the need for strong privacy precautions to improve acceptance and minimize implementation risks.

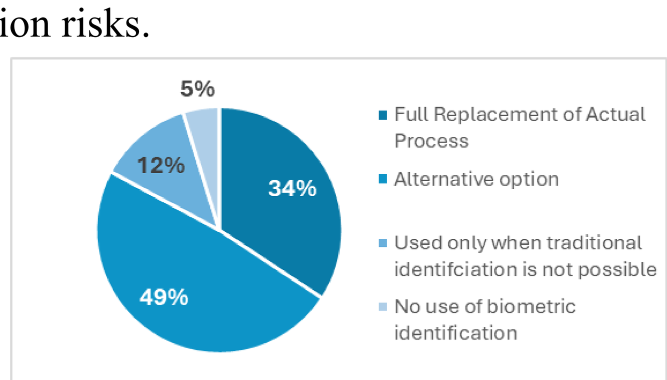

Figure 3
Respondents Opinions on Using Biometrics Identification in Health

Interviews with medical and administrative staff indicated that patient identification relies on physical documents and manually entered information, leading to occasional errors and delays during high demand periods, emergency situations, and complex clinical cases. Concerns were also raised regarding system reliability during outages or technical failures. Digitally integrated biometric systems were identified to reduce identification time, improve consistency, and minimize human error when time is crucial. Data protection remains essential; Puerto Rico Law 40-2012 mandates secure electronic health records linked to a unique patient identity, allowing biometric solutions to enhance existing compliant systems without full infrastructure replacement.

Recommendations

It is recommended that biometric identification implementation across participating healthcare facilities be coordinated through the Puerto Rico Department of Health to establish common operational standards, governance, and compliance requirements while allowing hospitals to retain control over internal systems and patient data. Privacy and regulatory compliance must be embedded in system design, ensuring alignment with federal regulations and Puerto Rico Law No. 40-2012, including secure storage, controlled access, and auditable activity. Federated or decentralized identity-matching architectures are recommended to minimize data exposure across institutions.

Initial implementation should be limited to emergency departments, where patient misidentification risk is highest due to time-critical care, high patient volume, and frequent visit of unconscious patients. Biometric identification should be integrated into existing electronic health record systems rather than deployed as standalone platforms, leveraging current compliant infrastructure and established clinical workflows. A hybrid identification approach is recommended to complement traditional methods, ensuring continuity of care during outages or system failures and supporting gradual user acceptance.

Prior to large-scale deployment, a controlled pilot program in selected emergency departments is recommended to evaluate identification time reduction, system reliability, staff acceptance, and privacy compliance. Pilot outcomes should guide system refinement and inform decisions on broader implementation across Puerto Rico.

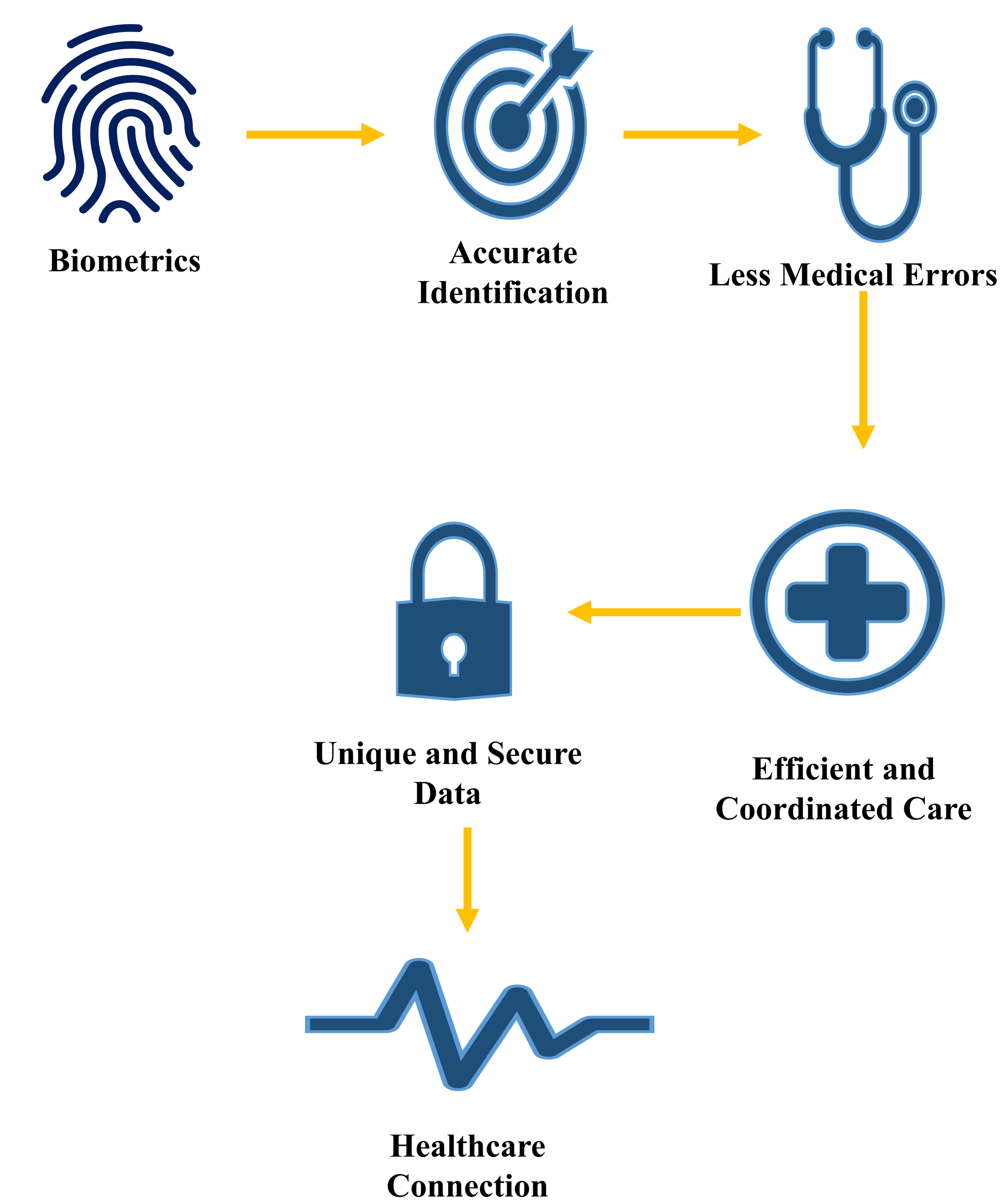

Figure 4
Biometric-Driven Improvements to Current Healthcare Systems

Conclusions

The adoption of biometric identification in Puerto Rico's healthcare system offers a strategic approach to reducing patient misidentification, particularly in emergency settings where speed and accuracy are critical. A phased, governance-driven implementation coordinated by the Puerto Rico Department of Health can balance innovation, regulatory compliance, and patient privacy while preserving institutional autonomy. Prioritizing emergency departments, integrating biometrics into existing electronic health record systems, and adopting hybrid identification models can enhance workflow continuity, system resilience, and user acceptance. A controlled pilot program is essential to evaluate performance and guide scalable, sustainable implementation.

References

[1] Nait-Ali, A. (2018). Biometrics under biomedical considerations (eText ISBN: 9789811311444). Springer Nature Singapore.

[2] Marana, Aparecido & Falguera, Juan & Jain, Anil & Sartori Falguera, Fernanda. (2006). Biometrics for Human Identification. RITA. 103-130.

[3] Haley P. The Impact of Biometric Surveillance on Reducing Violent Crime: Strategies for Apprehending Criminals While Protecting the Innocent. Sensors (Basel). 2025 May 17;25(10):3160. doi: 10.3390/s25103160. PMID: 40431950; PMCID: PMC12116099.

[4] Mason, J., Dave, R., Chatterjee, P., Graham-Allen, I., Esterline, A., & Roy, K. (2020). An investigation of biometric authentication in the healthcare environment. Array, 8, Article 100042. https://doi.org/10.1016/j.array.2020 .100042

[5] Sohn, J. W., Kim, H., Park, S. B., Lee, S., Monroe, J. I., Malone, T. B., Kinsella, T., Yao, M., Kunos, C., Lo, S. S., Shenk, R., & Machtay, M. (2020). Clinical Study of Using Biometrics to dentify Patient and Procedure. *Frontiers in oncology*, *10*, 586232. https://doi.org/10.3389/fonc.2020.586232

[6] CERTIFY.me. (2021, September 29). *Geisinger utilizes CERTIFY facial recognition*. CERTIFY.me. Retrieved December 12, 2025, from https://www.certify.me/blog/certify-health- expands-biometric-positive-patient-id-with-geisinger/

[7] Sterrett, L., Harris, C., Batra, N., Talbot, C., Chang, C., & Malhotra, R. (2022, October 19). *Preparing for the next generation of electronic health records*. Deloitte Insights. Retrieved November 29, 2025, from https://www.deloitte.com/us/en/insights/industry/health-care/ehr-systems- the-future-of-electronic-health-records.html