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From Curative to Preventive: Operationalising Hospital Without Walls for More Efficient Indonesia's Public Health Service Transformation in 2045

Dari Kuratif ke Preventif: Mengoperasionalkan Rumah Sakit Tanpa Dinding untuk Transformasi Pelayanan Kesehatan Masyarakat Indonesia yang Lebih Efisien di Tahun 2045

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ABSTRACT

Background: The rising aging population in Indonesia demands is transitioning healthcare from a curative to a preventive–promotive health paradigm as part of its national health system transformation toward Indonesia Emas 2045. Yet, an aging population, rising chronic disease burden, and geographic inequities threaten to overwhelm hospital capacity and the single-payer JKN system. The Hospital Without Walls (HWW) model—hospital-grade care extended into homes and communities through digital monitoring, telemedicine, and national interoperability—offers a systems-level redesign rather than a technology experiment. **Methods**: A narrative review was conducted using structured PubMed/MEDLINE searches (2014–2025) targeting core HWW components: hospital-at-home (HaH) with remote patient monitoring (RPM), ward-based continuous monitoring, pre-hospital telemedicine (smart ambulance), home/smart-home sensing, AI-assisted triage, and economic evaluations. Eligible PubMed-indexed RCTs, systematic reviews, and cohort studies were thematically synthesised around safety, efficiency, costs, and implementation relevance to Indonesia. **Results**: Nine high-quality studies indicate that HaH with RPM achieves non-inferior—and often superior—clinical outcomes and cost efficiency compared with conventional inpatient care. Pre-hospital telemedicine accelerates decision-making for time-critical conditions such as stroke and STEMI, while continuous monitoring and AI triage demand strong alert governance and local validation. Persistent risks of alarm fatigue, data gaps, and digital inequity emphasise the need for structured workflows and equitable design. **Conclusion**: Implementing HWW in Indonesia requires aligning JKN incentives (HaH iDRG tariffs, shared-savings mechanisms, risk-adjusted capitation), strengthening SATUSEHAT as the national utility layer, and ensuring workforce and connectivity readiness across regions. With these enablers, Indonesia can transform its health system from reactive to proactive—from curative to preventive—achieving safe, equitable, and sustainable distributed care by 2045.

ABSTRAK

Latar Belakang: Perubahan status demografi Indonesia yang menuju peningkatan populansi lansia menuntut adanya perubahan sistem pelayanan kesehatan dari paradigma kuratif menuju preventif-promotif. Hal ini sejalan dengan agenda Transformasi Sistem Kesehatan Nasional dan target Indonesia Emas 2045. Namun, beban penyakit kronis yang meningkat, populasi menua dan kesenjangan akses antarpulau berpotensi menekan kapasitas rumah sakit dan pembiayaan JKN. Konsep Hospital Without Walls (HWW)—yakni layanan rumah sakit yang diperluas ke rumah dan komunitas melalui pemantauan digital, telemedisin, dan sistem interoperabilitas nasional—dapat menjadi strategi sistemik, bukan sekadar adopsi teknologi. **Metode:** Kajian naratif ini menelaah literatur terindeks PubMed/MEDLINE (2014–2025) terkait pilar utama HWW: hospital-at-home (HaH) dengan remote patient monitoring (RPM), pemantauan kontinu di bangsal, telemedisin pra-rumah sakit (smart ambulance), sensor rumah pintar, triase berbasis AI, serta evaluasi ekonomi. Bukti dari RCT, tinjauan sistematik, dan studi kohort diekstraksi tematik dengan fokus pada keamanan, efisiensi, biaya, dan kesiapan implementasi di Indonesia. **Hasil:** Sembilan studi kunci menunjukkan bahwa HaH dengan RPM memberikan luaran klinis non-inferior dan efisiensi biaya signifikan dibanding rawat inap konvensional, sedangkan telemedisin pra-rumah sakit mempercepat pengambilan keputusan pada kasus waktu-kritis seperti stroke dan STEMI. Bukti terkini juga menyoroti risiko alarm fatigue dan bias AI, menegaskan pentingnya tata kelola peringatan, validasi lokal, serta desain inklusif agar kesenjangan digital tidak melebar**. Kesimpulan**: Penerapan HWW di Indonesia memerlukan reformasi insentif JKN (tarif Indonesian Diagnosis Related Groups, shared-savings, kapitasi berbasis risiko), penguatan SATUSEHAT sebagai lapisan utilitas nasional, serta kesiapan SDM dan infrastruktur konektivitas di wilayah 3T. Pendekatan ini dapat menggeser sistem kesehatan dari reaktif menjadi proaktif—dari kuratif ke preventif—menuju pelayanan kesehatan yang terdistribusi, berkeadilan, dan berkelanjutan untuk 2045.

INTRODUCTION

Indonesia is entering the final stretch toward Indonesia Emas 2045 with a rapidly aging population that is living longer but carrying a rising burden of chronic disease. Without systemic redesign, this trajectory will overextend hospital beds, budgets, and referral chains. The strategic question is no longer whether to digitise, but how to ensure that digital assets genuinely decompress hospitals while protecting equity across a geographically vast archipelago. Hospital Without Walls (HWW)—continuous, data-guided care that extends hospital-grade capabilities into homes and communities—offers a system-design answer rather than a technology demonstration. Evidence from hospital-at-home (HaH) programmes shows that when remote patient monitoring (RPM) is embedded in clinical workflows and escalation pathways, safety and efficiency improve while costs decline (1). For Indonesia, the urgency is twofold. Clinically, delayed recognition of deterioration—especially outside tertiary centres—drives avoidable admissions and adverse events. Operationally, bed pressure in metropolitan hubs coexists with uneven service quality across islands. RPM modalities such as high-frequency vital-sign tracking, continuous single-lead ECG, and fall detection have been identified as enablers to broaden HaH eligibility beyond very low-acuity cases without compromising safety, provided escalation rules and workforce roles are explicit (2).

At the same time, mixed findings from ward-based continuous monitoring caution against naïve adoption and highlight the need for context-sensitive design and evaluation (3). The HWW architecture bridges pure (technical/biomedical) and applied (clinical/operational) dimensions. On the technical side, emerging evidence covers smart-home and wearable sensing, edge/cloud integration, and AI-assisted triage that enable earlier and more personalised interventions (4).Yet cost realism matters in a single-payer context: systematic reviews in cardiovascular RPM indicate that cost-effectiveness is achievable when programmes prevent utilisation and shorten stays—parameters that Indonesia must test within JKN payment rules (5). On the pre-hospital link, telemedicine-enabled ambulances transmitting encrypted telemetry and location data to receiving teams show measurable gains in readiness, directly relevant to congested urban corridors and inter-island transfers (5)

Above all, equity must be designed in from the start: the digital divide can entrench disparities unless device access, connectivity, and digital literacy are explicitly funded and operationalised (6). Despite international progress, Indonesia still faces critical gaps: the absence of real-world HaH+RPM evaluations embedded in the Puskesmas–hospital referral chain, limited cost-effectiveness and payment models that reward prevention rather than volume, lack of locally validated AI-triage tools, and no established pre-hospital telemetry workflows connected to dispatch and traffic systems. These gaps converge into one strategic question—how can Indonesia operationalise HWW safely, equitably, and sustainably under JKN?

This review addresses that question by synthesising global and regional evidence to inform an Indonesian model of HWW. It aims to (1) define a framework aligned with national interoperability initiatives such as SATUSEHAT while avoiding “app-only” fragmentation; (2) consolidate clinical and operational findings on HaH+RPM for translation into Indonesia’s primary-care-led system; (3) analyse risks, ethics, and equity safeguards; and (4) map pragmatic adoption pathways—covering workforce readiness, device logistics, pre-hospital integration, and financing reform—to transform hospital care from facility-based to distributed, patient-centred care for the nation’s 2045 health vision.

MATERIAL AND METHOD

We conducted a narrative review with structured PubMed/MEDLINE searches targeting peer-reviewed, PubMed-indexed literature most relevant to the core building blocks of Hospital Without Walls (HWW): hospital-at-home with remote patient monitoring (HaH+RPM), ward-based continuous monitoring, pre-hospital telemedicine/“smart ambulance”, home/smart-home sensing, AI-assisted triage, and economic evaluations.

Searches covered publications from 1 January 2014 to 8 November 2025. We included adult-focused primary studies and reviews (randomised controlled trials, cohort studies, and systematic/scoping/narrative reviews)

conducted in hospital or pre-hospital settings and published in English. We excluded non-indexed/preprint/abstract-only items, paediatric-only studies unless clearly generalisable, and purely engineering papers lacking clinical or operational outcomes.

The search strategy applied Boolean Title/Abstract queries and, where useful, MeSH terms, using a canonical and reproducible keyword set:

1. HaH/RPM — ("hospital at home" OR "hospital-level care at home" OR "acute hospital care at home") AND ("remote patient monitoring" OR "telemonitoring" OR "Remote Patient Monitoring"[MeSH]);
2. ward continuous monitoring — ("continuous monitoring" OR "wearable monitoring") AND ("general ward" OR ward);
3. pre-hospital/smart ambulance — ("prehospital telemedicine" OR "telemedicine ambulance" OR "smart ambulance");
4. AI triage — ("artificial intelligence triage" OR "AI triage") AND ("emergency department" OR "Emergency Service, Hospital"[MeSH]);
5. economic evaluation — ("remote patient monitoring" OR telemonitoring) AND ("cost-effectiveness" OR "economic evaluation");
6. home/smart-home sensing — ("smart home" OR "ambient sensor" OR wearable) AND (health OR monitoring).

To surface context, we selectively appended an Indonesia/LMIC screening tag—AND (Indonesia OR "low and middle income" OR LMIC)—without applying it when it risked excluding core evidence. We will reuse this exact keyword set for any future updates to ensure methodological reproducibility. Study selection proceeded in two stages (titles/abstracts, then full texts) by one reviewer with senior adjudication where applicable; disagreements were resolved by re-inspection against the eligibility criteria.

We extracted pre-specified domains including population/setting; intervention or enabler (HaH+RPM, continuous monitoring, pre-hospital telemedicine, smart-home sensing, AI triage); comparator (usual care/none); and outcomes (clinical safety, utilisation/bed-days, costs/cost-effectiveness, timeliness, patient experience, and implementation risks). Evidence was synthesised thematically across the prespecified result themes, prioritising higher-quality and more recent studies (RCTs and systematic reviews) while preserving important operational insights from robust observational and scoping work.

RESULT & DISCUSSION

Discussion Across the nine PubMed-indexed studies reviewed, the throughline indicates that a Hospital Without Walls (HWW) approach is ready to be operationalised as a system strategy—rather than a technology demonstration—anchored by robust clinical evidence for hospital-at-home (HaH). Two randomised controlled trials show that substitutive home care for selected acute conditions can maintain safety and quality comparable to conventional inpatient care, while reducing utilisation and costs and improving patient experience (1,7).

Figure 1. Operating model of Indonesia's "Hospital Without Walls." The framework illustrates three integrated service layers—Home & Ambulance, Puskesmas & Community Health, and Hospital—connected by the SATUSEHAT national utility layer that enables secure data exchange (FHIR), digital identity, consent management, and role-based access. On the right, JKN financing pathways (HaH iDRG tariff, shared-savings, and risk-adjusted capitation) align incentives to reward prevention and efficient care. Arrows represent the system flow—signal → triage → outreach → escalation → claim—while key performance indicators (e.g., days alive and out of hospital, bed-days, readmissions, time to intervention) measure system effectiveness toward Indonesia's promotive–preventive health transformation agenda.

Table 1. PubMed-indexed studies informing the Hospital Without Walls (HWW) framework

Ref.	First author, year (journal)	Design / evidence type	HWW component / domain	Key finding relevant to HWW	Application in Indonesian HWW model
(1)	Levine, 2020 (Ann Intern Med)	Randomised controlled trial	Hospital at Home (HaH)	Substitutive HaH for selected acutely ill adults maintained safety and quality comparable to inpatient care, while reducing utilisation, costs, and improving patient experience.	Supports HaH as a safe and efficient way to shift "hospital-level capabilities" into homes for eligible conditions.
(7)	Levine, 2018 (J Gen Intern Med)	Pilot randomised controlled trial	Hospital at Home (HaH)	Pilot RCT showed feasibility and safety of HaH, with signals of reduced costs and length of stay compared with usual care.	Together with (1), underpins the statement that two RCTs support HaH as a credible substitutive care model.
(3)	Bowles, 2024 (Digital Health)	Systematic review and meta-analysis of RCTs	Continuous ward monitoring (hospital)	Continuous vital-sign monitoring on general wards did not show consistent statistically significant improvements in hard outcomes versus standard care.	Highlights that more sensors alone do not guarantee better outcomes; monitoring must be tied to meaningful actions.
(9)	Downey, 2018 (Int J Nurs Stud)	Systematic review and narrative synthesis	Continuous ward monitoring (hospital)	Identified feasibility but also implementation challenges, including false alarms, alarm burden, and added workload for staff.	Justifies framing continuous monitoring as an enabler that requires robust alert governance and workflow redesign.
(4)	Morita, 2023 (JMIR MHealth UHealth)	Scoping review	Smart-home and ambient sensors (home/community)	Described a broad range of smart-home health technologies with growing technical maturity and generally favourable user acceptance when burden is low and integrated into routine practice.	Supports use of low-burden smart-home and ambient sensors to strengthen early detection and proactive community action.
(5)	Sarpourian, 2023 (Prehosp Disaster Med)	Systematic review	Prehospital telemedicine for stroke	Ambulance-based telemedicine for stroke was feasible and allowed remote neurological assessment and decision support before hospital arrival.	Underpins positioning ambulances as mobile clinical nodes using telemedicine to improve pre-hospital stroke pathways.
(10)	Moxham, 2024 (CJC Open)	Systematic review and meta-analysis	Prehospital 12-lead ECG and pre-alert (STEMI)	Prehospital acquisition and digital transmission of 12-lead ECG were associated with shorter contact-/door-to-device times and lower early mortality in STEMI.	Justifies Hybrid Smart Ambulance workflows with ECG transmission and cath-lab pre-alert in the HWW model.

(11)	Bøtker, 2018 (Scand J Trauma Resusc Emerg Med)	Systematic review	Prehospital point-of-care ultrasound (POCUS)	Prehospital POCUS was feasible and changed diagnosis, clinical decisions, and transport destination in a meaningful proportion of cases.	Supports inclusion of POCUS in protocolised prehospital ABCDE triage within Hybrid Smart Ambulance services.
(12)	Steinhubl, 2018 (JAMA)	Randomised clinical trial (mSToPS)	Home-based wearable ECG / remote monitoring	Immediate home wearable ECG monitoring increased detection of previously undiagnosed atrial fibrillation and initiation of appropriate anticoagulation.	Provides evidence that home-based signals can reliably drive clinical action when embedded in clear workflows and reimbursement.

For Indonesia—facing a growing chronic disease burden, inter-island service disparities, and the Indonesia Emas 2045 horizon—these findings support shifting part of "hospital-level capabilities" into homes and communities as a credible way to decompress bed capacity, provided eligibility criteria, escalation pathways, and workforce roles are clearly defined. Importantly, this direction is aligned with current national policy: the Ministry of Health has publicly repositioned health reform from a curative focus toward promotive–preventive care under its six-pillar "health transformation" agenda, operationalised through SATUSEHAT as the national interoperability backbone; in 2024 the ministry also announced a 50:50 budget rebalance between promotive–preventive and curative efforts—making HWW a timely strategic fit rather than an optional pilot (8).

Evidence on continuous ward monitoring provides a necessary counterbalance: however intuitive, greater sensor intensity does not automatically translate into better hard outcomes. The most recent systematic review found no significant differences versus standard care (3), while earlier work highlights risks of alarm fatigue and workflow burden when alert governance is immature (9). In the Indonesian context, monitoring should therefore be positioned as an enabler that is effective only when alert thresholds are explicitly linked to concrete clinical actions (e.g., same-day outreach or protocolised intervention) and when alert stewardship actively controls noise.

Extending this signal-to-action logic downstream, a realistic path for Indonesia is a sensor-rich, clinician-led "Hybrid Smart Ambulance" paired with a home-monitoring kit, not self-driving fleets. On the road, paramedic-driven ambulances equipped with digitally transmitted 12-lead ECG for suspected STEMI (with pre-alert to the receiving cath-lab), portable ultrasound (POCUS) for ABCDE triage in trauma/dispnoea, standard monitors (SpO_2, non-invasive blood pressure, temperature), point-of-care glucose/electrolytes/lactate, and secure telemedicine video allow specialists to "arrive" virtually before the vehicle does;

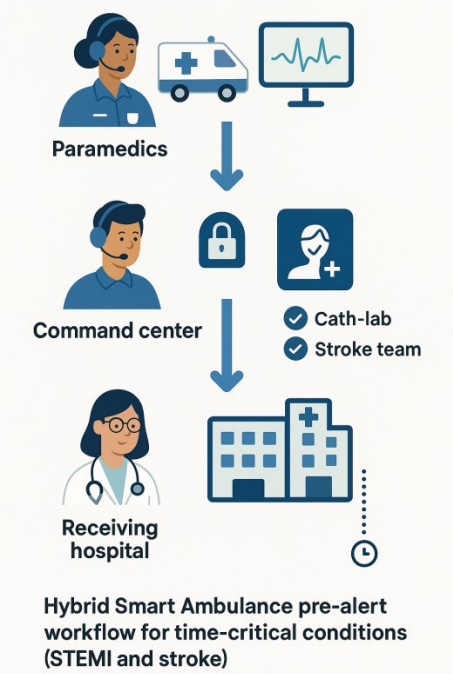

Figure 2. Hybrid Smart Ambulance pre-alert workflow. Real-time ECG or tele-stroke video enables pre-alert activation, ensuring hospital team readiness before arrival and shortening treatment time within the Hospital Without Walls system.

meta-analytic and observational evidence associate prehospital ECG acquisition and transmission with significantly shorter contact/door-to-device times and lower early mortality, supporting this pre-alert workflow in LMIC settings as well as HICs (10). Complementarily, prehospital POCUS is feasible, alters clinical decisions and transport destination in meaningful proportions, and is most useful when embedded in protocolised pathways and governance—precisely the model Indonesia can adopt as connectivity improves (11).

At home, the HaH/RPM kit should mirror the same operational logic: a single-lead wearable ECG patch for at-risk atrial fibrillation linked to anticoagulation decisions, plus BP cuff, pulse oximeter, thermometer, scale (e.g., rules for heart-failure weight-gain triggers), spirometer/PEF for COPD/asthma, and low-burden ambient sensors (activity/fall, passive infrared motion, under-mattress respiratory/heart-rate during sleep) that trigger same-day outreach by Puskesmas teams when thresholds are crossed; randomised evidence shows immediate home wearable ECG monitoring increases AF detection and

appropriate anticoagulation initiation, confirming that home signals can reliably drive clinical action when embedded in workflow and reimbursement (12).

Economically, cardiovascular evidence suggests that remote patient monitoring (RPM) can be cost-effective when it truly prevents utilisation and shortens length of stay—yet results depend heavily on programme design and comparators, making JKN-based evaluation imperative before scaling (13). This aligns with Indonesia's financing reality: without aligned incentives, hospitals and Puskesmas will struggle to shift care "earlier, closer, smarter."

Upstream, scoping evidence on smart-home and ambient sensors indicates technical maturity and user acceptance when patient burden is low and integration with routine practice is preserved (4). Given the Puskesmas/Posyandu network and community midwives/nurses, technology in Indonesia should strengthen early detection and proactive action—not add documentation load. Pre-hospital links remain pivotal for time-critical pathways such as stroke, where ambulance telemedicine—video plus encrypted telemetry—is associated with faster decision-making and better readiness of receiving teams; in Indonesia's metropolitan corridors and inter-island routes, ambulances as mobile clinical nodes are a near-term HWW gain, provided orchestration with dispatch, traffic prioritisation, and hospital pre-alerts is in place (5).

Overarching these components, AI-assisted triage offers potential gains in accuracy and throughput, but recent systematic evidence underscores safety and bias risks; implementation must therefore remain human-in-the-loop, externally validated, and calibrated to local populations and languages (14). Consistently, thematic reviews of RPM oriented to extending HaH emphasise that clinical benefit emerges when RPM is embedded within end-to-end workflows rather than relegated to peripheral pilots (15). In synthesis, the implications for Indonesia are to begin with the most proven component (HaH for clearly defined adult conditions) while rigorously linking signals to actions in ambulances and homes, balancing the risks and benefits of continuous monitoring, prioritising pre-hospital telemedicine for time-critical pathways, and using smart-home sensors to amplify community outreach.

Success will depend on data and alert governance, workforce readiness, and—critically—financing that matches prevention logic. Without a payment roadmap that aligns incentives, sensors and apps will remain pilots; with the right incentives and SATUSEHAT acting as a utility layer to move FHIR-based events securely across homes–Puskesmas–hospitals, the earlier detection → earlier treatment chain can become routine on the road to 2045.

CONCLUSION AND RECOMMENDATION

Indonesia is ready to shift Hospital Without Walls (HWW) from vision to execution by anchoring on proven hospital-at-home (HaH) with remote patient monitoring (RPM)—which matches inpatient safety and quality while lowering utilisation and costs—then building the system around it: align JKN incentives to prevention (dedicated HaH tariffs, shared-savings for Puskesmas–hospital networks, and risk-adjusted capitation), operationalise SATUSEHAT as a national utility layer (trusted identity, FHIR data flows, consent/provenance, role-based access, observability) so signals reliably trigger same-day outreach, and deploy a sensor-rich, clinician-led Hybrid Smart Ambulance plus complementary home-monitoring kits to convert early signals into earlier decisions and treatment. Success hinges on clear signal-to-action workflows from ambulance to home, disciplined alert stewardship, a trained workforce with 24/7 virtual oversight, and equity by design (device/connectivity support, 4G/5G with satellite backup for 3T regions). AI should augment—not replace—clinicians, with human-in-the-loop guardrails and local validation. With phased, pragmatic evaluation that tracks safety, days alive and out of hospital, bed-days, readmissions, costs, and patient experience—and scale-up tied to results—HWW can systematically decompress hospital beds, improve outcomes, and advance Indonesia's promotive–preventive agenda toward Indonesia Emas 2045.

REFERENCES

1. Levine DM, Ouchi K, Blanchfield B, Saenz A, Burke K, Paz M, et al. Hospital-Level Care at Home for Acutely Ill Adults: A

Randomized Controlled Trial. Ann Intern Med [Internet]. 2020 Jan 21 [cited 2025 Nov 8];172(2):77–85. Available from: https://www.acpjournals.org/doi/10.7326/M19-0600

2. Whitehead D, Conley J. The Next Frontier of Remote Patient Monitoring: Hospital at Home. J Med Internet Res [Internet]. 2023 Mar 16 [cited 2025 Nov 8];25:e42335. Available from: https://www.jmir.org/2023/1/e42335

3. Bowles T, Trentino KM, Lloyd A, Trentino L, Jones G, Murray K, et al. Outcomes in patients receiving continuous monitoring of vital signs on general wards: A systematic review and meta-analysis of randomised controlled trials. Digit Health [Internet]. 2024 Jan [cited 2025 Nov 8];10:20552076241288826. Available from: https://journals.sagepub.com/doi/10.1177/20552076241288826

4. Morita PP, Sahu KS, Oetomo A. Health Monitoring Using Smart Home Technologies: Scoping Review. JMIR MHealth UHealth [Internet]. 2023 Apr 13 [cited 2025 Nov 8];11:e37347. Available from: https://mhealth.jmir.org/2023/1/e37347

5. Sarpourian F, Ahmadi Marzaleh M, Fatemi Aghda SA, Zare Z. Application of Telemedicine in the Ambulance for Stroke Patients: A Systematic Review. Prehospital Disaster Med [Internet]. 2023 Dec [cited 2025 Nov 8];38(6):774–9. Available from: https://www.cambridge.org/core/product/identifier/S1049023X23006519/type/journal_article

6. Saeed SA, Masters RM. Disparities in Health Care and the Digital Divide. Curr Psychiatry Rep [Internet]. 2021 Sept [cited 2025 Nov 8];23(9):61. Available from: https://link.springer.com/10.1007/s11920-021-01274-4

7. Levine DM, Ouchi K, Blanchfield B, Diamond K, Licurse A, Pu CT, et al. Hospital-Level Care at Home for Acutely Ill Adults: a Pilot Randomized Controlled Trial. J Gen Intern Med [Internet]. 2018 May [cited 2025 Nov 9];33(5):729–36. Available from: http://link.springer.com/10.1007/s11606-018-4307-z

8. TRANSFORMASI KESEHATAN INDONESIA [Internet]. [cited 2025 Nov 9]. Available from: https://kemkes.go.id/id/layanan/transformasi-kesehatan-indonesia?utm_source=chatgpt.com

9. Downey CL, Chapman S, Randell R, Brown JM, Jayne DG. The impact of continuous versus intermittent vital signs monitoring in hospitals: A systematic review and narrative synthesis. Int J Nurs Stud [Internet]. 2018 Aug [cited 2025 Nov 8];84:19–27. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0020748918300981

10. Moxham RN, d'Entremont MA, Mir H, Schwalm J, Natarajan MK, Jolly SS. Effect of Prehospital Digital Electrocardiogram Transmission on Revascularization Delays and Mortality in ST-Elevation Myocardial Infarction Patients: Systematic Review and Meta-Analysis. CJC Open [Internet]. 2024 Oct [cited 2025 Nov 9];6(10):1199–206. Available from: https://linkinghub.elsevier.com/retrieve/pii/S2589790X24002804

11. Bøtker MT, Jacobsen L, Rudolph SS, Knudsen L. The role of point of care ultrasound in prehospital critical care: a systematic review. Scand J Trauma Resusc Emerg Med [Internet]. 2018 Dec [cited 2025 Nov 9];26(1):51. Available from: https://sjtrem.biomedcentral.com/articles/10.1186/s13049-018-0518-x

12. Steinhubl SR, Waalen J, Edwards AM, Ariniello LM, Mehta RR, Ebner GS, et al. Effect of a Home-Based Wearable Continuous ECG Monitoring Patch on Detection of Undiagnosed Atrial Fibrillation: The mSToPS Randomized Clinical Trial. JAMA [Internet]. 2018 July 10 [cited 2025 Nov 9];320(2):146. Available from: http://jama.jamanetwork.com/article.aspx?doi=10.1001/jama.2018.8102

13. Zhang Y, Peña MT, Fletcher LM, Lal L, Swint JM, Reneker JC. Economic evaluation and costs of remote patient monitoring for cardiovascular disease in the United States: a systematic review. Int J Technol Assess Health Care [Internet]. 2023 [cited 2025 Nov 8];39(1):e25. Available from: https://www.cambridge.org/core/product/identifier/S0266462323000156/type/journal_article

14. Ahmed Abdalhalim AZ, Nureldaim Ahmed SN, Dawoud Ezzelarab AM, Mustafa M, Ali Albasheer MG, Abdelgadir Ahmed RE, et al. Clinical Impact of Artificial Intelligence-Based Triage Systems in Emergency Departments: A Systematic Review. Cureus [Internet]. 2025 June 9 [cited 2025 Nov 8]; Available from: https://www.cureus.com/articles/375105-clinical-impact-of-artificial-intelligence-based-triage-systems-in-emergency-departments-a-systematic-review

15. Whitehead AK, Li Z, LaPenna KB, Abbes N, Sharp TE, Lefer DJ, et al. Cardiovascular dysfunction induced by combined exposure to nicotine inhalation and high-fat diet. Am J Physiol Heart Circ Physiol. 2024 Jan 1;326(1):H278–90.