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Preface

Journal of Indian Physician Associates – JIPA, April 2026

It is with profound happiness and gratitude that I bring to you the second edition of the *Journal of Indian Physician Associates* (JIPA), a biannual, peer-reviewed publication, which has walked through one successful year of overwhelming acceptance, response, and contribution from the Indian and global Physician Associate (PA) community.

Physician Associates and their comparables have served the medical community for several decades, proving to be a highly skilled cadre of healthcare professionals with valuable contributions across the entire medical spectrum. PAs have carved their niche in the academic and scientific arena, embarking on the combined, competitive, and collaborative environment of hospitals, research institutions, and scholarly organizations where knowledge is produced, debated, and disseminated.

The JIPA encompasses academic research, scientific publishing, and intellectual discourse and serves as a platform for Indian and global Physician Associates to obtain valuable insights into new information, applications and outcomes. The second edition of the JIPA includes eight competent articles comprising highly valuable original research work, review articles, case reports, case series, and opinion editorial work. We believe that the current issue illuminates the intellectual medical practice of PAs supported by empirical research. I thank the authors for their scholarly work and research inputs featured in this issue. I truly appreciate and acknowledge the high-impact contributions from other healthcare, primary, and public health professionals to JIPA.

I extend my sincere gratitude to the entire team of JIPA, led by Mr. Ashish Gaur (Editor-in-Chief), Dr. Tanmay Acharya (Coeditor-in-Chief), members of the editorial team, reviewers, advisors, global experts, and members of our International Veritas Council for being an integral part of JIPA and taking our vision in influencing the academic and professional growth of the Indian PA community.

I am grateful to the Indian Association of Physician Associates for giving JIPA the strongest backing right from its conception to the everyday functioning of this strenuous endeavor and making the journey possible. My heartfelt thanks to our funding partners for their unwavering support.

JIPA fosters a trusted platform for high-quality, universally accessible, peer-reviewed research articles that drive the PA community to accelerate scientific discovery and intellectual pursuit. I hope that this issue will add value to the reader's intellectual growth, thereby anticipating increased scientific writing from the PAs.

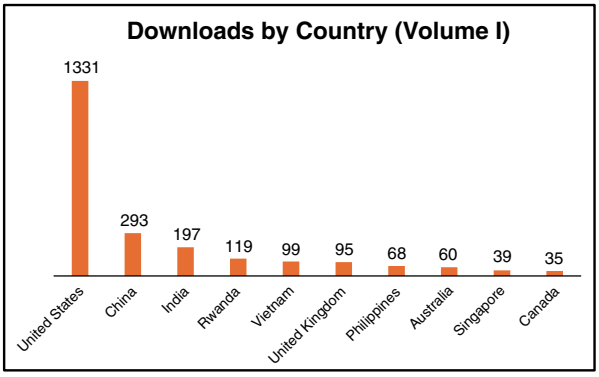
M Arockia Grazy
Managing Editor, Journal of Indian Physician Associates
Senior Cardiothoracic Surgical Associate – Royal Care Super Specialty Hospital, Coimbatore
President – Indian Association of Physician Assistants, Tamil Nadu Chapter

From the Editor's Desk

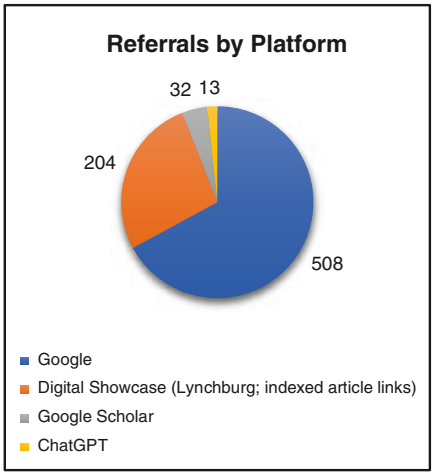
It is with a sense of purpose and academic responsibility that we present Volume II of the Journal of Indian Physician Associates (JIPA).

This edition brings forth eight rigorously peer-reviewed contributions, encompassing original investigations, review articles, case-based analyses, and narrative scholarship—each reflecting methodological discipline and clinical relevance.

The response to our inaugural volume has been both affirming and instructive. Our journal has witnessed meaningful global dissemination, with article downloads distributed across diverse geographies.



Equally significant is the pattern of referral-driven academic access, indicative of early citation behaviour and discoverability. The metrics populated in the chart underscore an important transition—from visibility to citation integration, marking JIPA's early consolidation within the global academic ecosystem.



Major Scientific Discoveries (2025)

The year 2025 has been characterised by a remarkable convergence of scientific disciplines, where advances across biology, computation, physics, and environmental sciences are collectively reshaping the future of medicine and human understanding.

1. **Gene Editing & Precision Medicine**
   Rapid advancements in CRISPR-based technologies, including base and prime editing, have accelerated the transition of gene therapy from experimental frameworks to clinical applicability, particularly in monogenic disorders and oncology.
2. **Artificial Intelligence in Drug Discovery**
   AI-driven platforms have significantly compressed drug discovery timelines, enabling predictive molecular modelling, protein structure determination, and early-phase therapeutic design—heralding a shift toward algorithm-assisted biomedical innovation.
3. **Space Science & Cosmology**
   Observations from next-generation telescopes, particularly the James Webb Space Telescope, have deepened insights into early galaxy formation, exoplanetary atmospheres, and the fundamental architecture of the universe.
4. **Nuclear Fusion**
   Continued progress in controlled fusion research, building upon breakthroughs at Lawrence Livermore National Laboratory, has advanced the feasibility of sustainable, high-yield clean energy.
5. **Quantum Computing Milestones**
   Developments by organizations such as IBM and Google have improved qubit stability and error correction, bringing quantum systems closer to practical, real-world applications.
6. **Climate Science & Energy Innovation**
   Advances in carbon capture technologies, perovskite solar cells, and green hydrogen ecosystems reflect a decisive shift toward scalable climate solutions and sustainable energy frameworks.
7. **Infectious Diseases & Vaccinology**
   The expansion of mRNA platforms beyond pandemic response, alongside progress toward universal vaccines and improved global immunisation strategies, signals a new era of rapid-response, platform-based vaccinology.

Within cardiovascular science, these broader advances have translated into tangible clinical evolution

- Enhanced mechanical circulatory support with devices such as HeartMate 3 and emerging physiological systems like CorWave LVAD
- Progress in xenotransplantation and organ bioengineering
- Integration of AI in cardiac imaging and surgical planning
- Expansion of normothermic machine perfusion
- Advances in immunomodulation and rejection surveillance
- Early promise of regenerative cardiology and RNA-based therapeutics

These developments are not isolated—they represent a unified shift toward precision, prediction, and personalization in medicine.

For Physician and Surgical Associates—professionals who stand at the intersection of evolving science and clinical application—the imperative is clear: to engage deeply with evidence, to critically evaluate emerging knowledge, and to translate innovation into responsible patient care.

JIPA, in this context, aspires to be more than a journal. It seeks to function as a platform for scientific discernment, for clinicians who not only follow science, but decode its trajectory and define its application.

We are further strengthened by the inclusion of senior educators and clinical experts from the National Health Service (NHS), United Kingdom, enhancing the depth and global alignment of our academic processes.

As we move forward, we invite:

- Original, methodologically robust research
- Thoughtful academic discourse
- Active citation and scholarly engagement

The future of medicine will not be shaped solely by discovery, but by the clarity with which we interpret it and the integrity with which we apply it.

On behalf of the editorial board, I extend my sincere appreciation for your continued engagement with JIPA.

Sincerely,

Ashish Gaur
Editor-in-Chief
Journal of Indian Physician Associates (JIPA)
Joint Secretary, IAPA
Senior Surgical Associate/Senior Manager
Department of Heart Transplants & Adv Cardiac Surgery
Sir HN Reliance Hospital, Mumbai

From the Co-Editor's Desk

It is a privilege to present the second issue of the Journal of Indian Physician Associates (JIPA). Following the successful launch of our inaugural issue, this edition represents an important step forward in our journey to establish JIPA as a credible, impactful, and enduring academic platform for Physician Associates in India and beyond.

The response to our first issue was both encouraging and inspiring. It highlighted a growing interest among Physician Associates to engage in scholarly activities, share clinical experiences, and contribute to evidence-based practice. With this second issue, we aim to build on that momentum by presenting a richer and more diverse compilation of academic work.

In this edition, readers will find a thoughtfully curated selection of original research articles, comprehensive reviews, case reports, and expert perspectives. These contributions span multiple specialties and reflect the expanding scope, clinical competence, and academic potential of Physician Associates. Importantly, many of these works address practical challenges in patient care, innovative approaches in clinical practice, and emerging trends in healthcare delivery—areas where Physician Associates play a crucial and evolving role.

We also recognize that developing a strong research culture within our profession is an ongoing process. The Journal of Indian Physician Associates (JIPA) seeks to serve not only as a publication platform but also as a catalyst for academic growth. We are committed to encouraging first-time authors, supporting young researchers, and promoting collaborations across institutions, both nationally and internationally.

I would like to express my sincere appreciation to our authors for their valuable contributions, to our reviewers for their rigorous and thoughtful evaluations, and to our editorial board for their unwavering dedication to maintaining the quality and integrity of the journal. Their collective efforts continue to shape JIPA into a publication that reflects both academic rigor and professional relevance.

As we move ahead, we warmly invite Physician Associates, educators, clinicians, and researchers to actively participate in this academic endeavor—whether by submitting manuscripts, engaging in peer review, or contributing ideas that can further strengthen the journal.

We believe that the Journal of Indian Physician Associates (JIPA) has the potential to become a strong academic voice for our profession, fostering knowledge sharing, professional identity, and global recognition for Physician Associates.

Thank you for your continued support and trust.

Sincerely,

Dr. Tanmay Acharia, DMSc
President, IAPA
Co-Editor in Chief
Journal of Indian Physician Associates (JIPA)
Senior Surgical Associate/Team Leader
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ORIGINAL RESEARCH ARTICLE

Evaluating the Suitability of the Berg Balance Scale for Assessing Balance in Diabetes Patients with and without Prior COVID-19: A Methods-Validation Study

Garima Kaushik[a], Sheetal Malhan[b], Apoorva Tiwari[c], and Vishakha[d]

Submitted: 30-Jan-2026; Accepted: 8-Mar-2026

Abstract

Background: Balance impairment in diabetes mellitus is predominantly driven by somatosensory loss secondary to peripheral neuropathy. The Berg Balance Scale (BBS) is widely used to evaluate functional balance, yet it mainly reflects motor performance and may not adequately represent sensory mechanisms. Following COVID-19, additional concerns regarding deconditioning have emerged, but interpretation depends on the measurement tool employed.

Objective: To examine the construct behavior and suitability of the BBS for assessing balance in individuals with diabetes with and without prior COVID-19 infection and to determine whether the scale reflects known determinants of diabetic imbalance.

Methods: A cross-sectional analysis was conducted on 151 adults with diabetes (75 without COVID-19; 76 with prior COVID-19). Participants were assessed using the BBS. Associations between BBS scores and exercise habits, dietary adherence, and age were analyzed to explore construct validity. Independent t-tests and ANOVA were applied with significance at $p < 0.05$.

Results: Mean BBS scores did not differ significantly between cohorts ($p = 0.22$). Strong gradients were observed with exercise and dietary adherence ($p < 0.001$), while relationships with factors presumed to be sensory in origin were limited. These patterns indicate that the BBS is responsive primarily to motor conditioning.

Conclusion: The BBS alone is insufficient as a comprehensive measure of balance impairment in diabetes because it underrepresents somatosensory dysfunction. An integrated assessment combining BBS with sensory instruments such as the MiniBEST or Michigan Neuropathy Screening Instrument is recommended.

Keywords diabetes mellitus; Berg Balance Scale; neuropathy; COVID-19; balance assessment; methods validation

Introduction

Balance dysfunction in diabetes mellitus is a multifactorial problem in which loss of somatosensory input plays a central role. Peripheral neuropathy leads to diminished vibration sense, impaired joint position awareness, and altered plantar pressure distribution, which together disrupt postural orientation and increase fall risk. Previous investigations have shown that sensory deficits correlate more strongly with postural sway than isolated muscle weakness, indicating that motor performance tests alone may provide an incomplete picture of diabetic imbalance.[1,2] The Berg Balance Scale (BBS) is widely used in clinical practice because it is simple and functionally oriented; however, the scale primarily evaluates anticipatory and motor control tasks and contains limited representation of sensory organization.[3]

The COVID-19 pandemic introduced additional concerns regarding deconditioning, prolonged inactivity, and neurological sequelae that could further influence balance in people with diabetes. Reports from post-COVID cohorts describe fatigue, dizziness, and reduced mobility, yet the measurement tools used in many studies were motor focused and may not have captured the dominant sensory pathology

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present in diabetes.[4–6] For clinicians, the critical question is therefore not only whether COVID-19 worsens balance but also whether the instruments commonly employed are capable of detecting the mechanisms that truly drive instability in this population.

This study reinterprets previously collected data from a methodological perspective. Rather than testing a causal effect of COVID-19, the aim is to examine the behavior of BBS scores in relation to known determinants of diabetic imbalance and to evaluate whether the scale demonstrates adequate construct validity.[1,2,7]

Methodology

Design and Participants

A cross-sectional analysis was performed on 151 adults with established diabetes mellitus recruited from outpatient and community settings. Participants were classified into two cohorts: diabetes without prior COVID-19 infection (DMNC, $n = 75$) and diabetes with documented previous infection (DMC, $n = 76$). Information regarding the level of care during COVID-19 infection (home management, hospitalization, steroid exposure, and ICU/ventilation) was not recorded in the original dataset. Consequently, severity-stratified analysis of BBS performance could not be performed.

Inclusion criteria: adults with confirmed diabetes mellitus able to follow testing instructions and a minimum of four weeks post-COVID recovery for the DMC cohort.

Exclusion criteria: history of ICU-acquired neuropathy/myopathy, acute neurological disorders unrelated to diabetes, recent lower-limb surgery, or conditions precluding safe balance testing.

These criteria were incorporated to minimize confounding from critical-illness-related neuromuscular deficits that could distort the interpretation of BBS performance.

The study focused on evaluating the measurement properties of the BBS across these clinically stratified groups.

Outcome Measure

The Berg Balance Scale consists of 14 functional tasks scored from 0 to 4 with a maximum score of 56.[3] The items emphasize standing balance, transfers, reaching, and turning activities that largely depend on motor strength and anticipatory control, while sensory discrimination and vestibular integration are minimally represented.[1,2] Each task is scored from 0 to 4, producing a total score range of 0–56, with higher scores indicating better balance. Scores below 45 are generally associated with an increased risk of falls, while scores under 40 reflect substantial impairment. The BBS demonstrates high interrater and test-retest reliability and has been validated in older adults and various neurological conditions.[3]

Additional Variables

Demographic and clinical variables expected to influence motor capacity were recorded, including age, habitual exercise pattern, dietary adherence, and vaccination status.[7]

Procedure

The study was conducted in accordance with the ethical standards of the institutional research committee and the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee (SU/SMS&R/76-A/2022/23). Written informed consent was obtained from all participants prior to participation in the study.

After obtaining informed consent, demographic data and clinical information were collected, including age, gender, exercise habits, dietary practices, and vaccination status. Balance assessment was then performed using standardized instructions for the Berg Balance Scale.

Construct Validation Approach

BBS validity was explored through:

1. Association with motor-related variables (exercise, diet),
2. Relationship with age,
3. Ability to discriminate groups expected to differ primarily in sensory status.

Statistical Approach

Continuous data were expressed as the mean ± standard deviation. Independent *t* tests compared BBS scores between cohorts, while one-way ANOVA examined gradients across exercise and dietary categories.[1,8] The analytic emphasis was on patterns of association that would inform the validity of the BBS as a measure of diabetic balance.

Results

Participant Characteristics

A total of 151 individuals with diabetes mellitus participated in the study. Participants were divided into two groups based

on COVID-19 history: diabetes without COVID-19 (DMNC; $n = 75$) and diabetes with COVID-19 (DMC; $n = 76$).

Both type 1 and type 2 diabetes mellitus were included. In the DMC group, only one participant had type 1 diabetes mellitus and the remaining 75 had type 2 diabetes mellitus. Similarly, in the DMNC group, six participants had type 1 diabetes mellitus and sixty-nine had type 2 diabetes mellitus. This distribution indicates a higher prevalence of type 2 diabetes mellitus in the study population.

Comparison of Balance Performance Between Groups

The mean Berg Balance Scale score was 42.97 ± 5.39 in the diabetes mellitus without a history of COVID-19 group and 44.08 ± 5.64 in those with prior COVID-19 infection group. The difference between the two groups was not statistically significant ($p = 0.22$), indicating that a previous history of COVID-19 did not significantly influence balance performance (Fig. 1).

Effect of Exercise on Balance

Exercise habits showed a clear association with balance performance. Participants who engaged in regular physical activity demonstrated significantly higher balance scores compared to those exercising occasionally or not exercising at all. The association between exercise habits and balance performance was statistically significant ($p < 0.001$), highlighting the protective role of physical activity on postural control (Fig. 2).

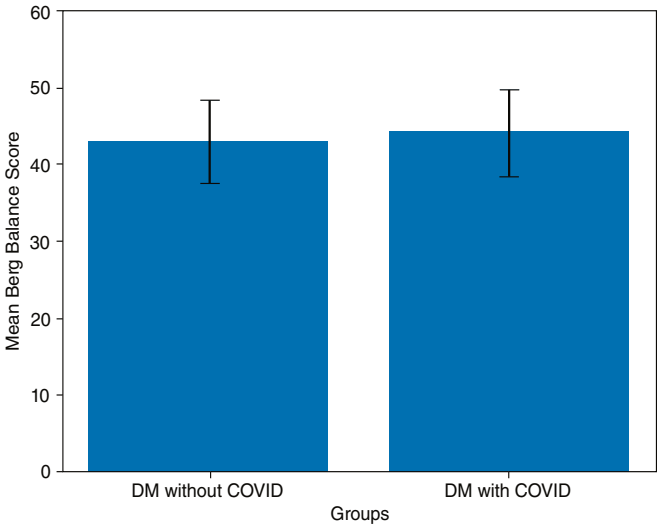

Figure 1 Comparison of mean Berg Balance Scale scores between individuals with diabetes mellitus with and without a history of COVID-19

Effect of Diet on Balance

Participants adhering to a controlled diet showed significantly better balance scores than those without dietary control ($p < 0.001$). This finding emphasizes the importance of nutritional management in maintaining functional stability among individuals with diabetes (Fig. 3).

Effect of Age on Balance

Age demonstrated a significant association with balance performance in the DMNC group, with progressively lower scores observed in older age groups. This association was

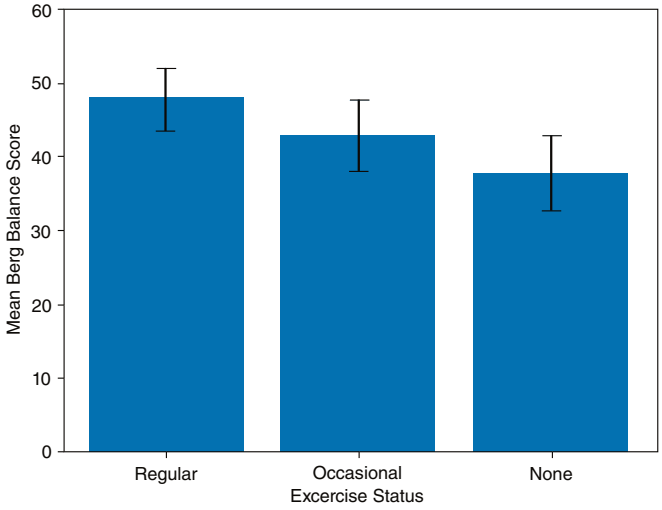

Figure 2 Comparison of Berg Balance Scale scores according to exercise habits

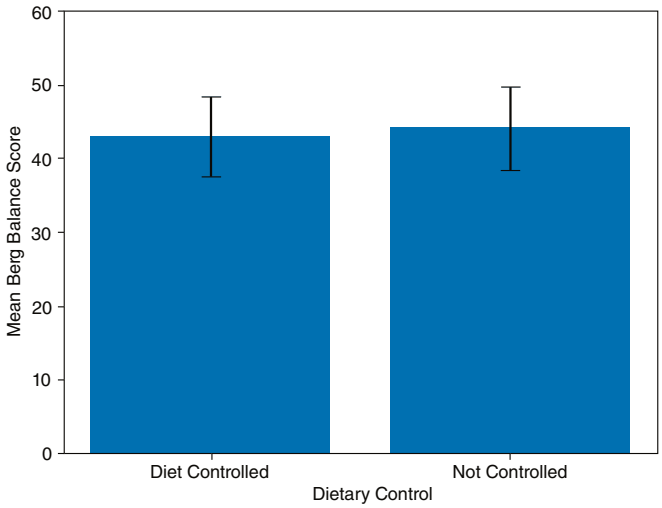

Figure 3 Comparison of Berg Balance Scale scores according to dietary control

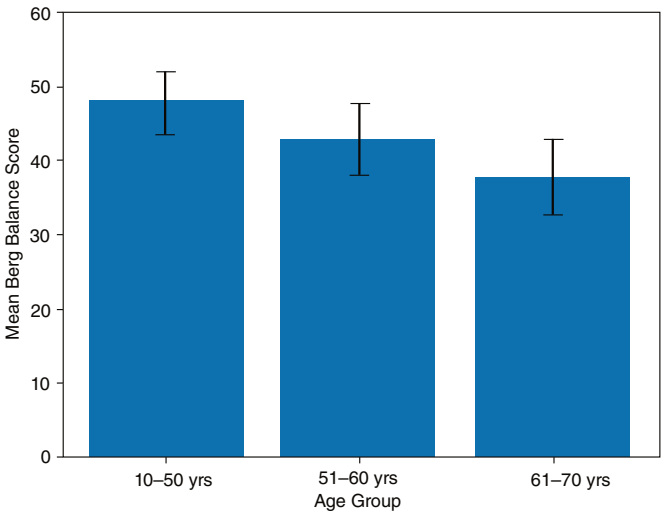

Figure 4 Comparison of Berg Balance Scale scores across different age groups

not statistically significant in the DMC group. Overall, balance scores declined with increasing age, indicating age-related deterioration in postural control. Participants aged 40–50 years demonstrated the highest scores, while those aged 61–70 years showed the lowest balance performance, indicating age-related deterioration in postural control (Fig. 4).

Collectively, these findings indicate that the BBS is highly responsive to variables reflecting motor conditioning and lifestyle but provides limited discrimination for factors presumed to be sensory in origin.[1,2]

Discussion

From a methodological viewpoint, the behavior of the BBS in this dataset highlights important limitations when the scale is used as the sole indicator of balance in diabetes. Consideration of COVID-19 severity is essential because hospitalization, exposure to systemic steroids, and ICU care can worsen glycemic control and precipitate critical-illness neuropathy, mechanisms distinct from typical diabetic sensory loss. By screening for ICU-related neuropathy and recording management category, the analysis sought to reduce this confounding, yet the motor-oriented nature of the BBS remains a constraint.

The absence of a difference between cohorts cannot be interpreted as evidence that COVID-19 has no impact; rather, it suggests that a motor-oriented instrument may be insensitive to the sensory neuropathic mechanisms that dominate diabetic instability.[1,2,4] Severity-related factors may influence balance through metabolic and neuromuscular pathways not captured by the BBS.

The robust association between BBS scores and exercise or diet confirms that the scale effectively captures motor capacity and general physical conditioning.[7] This property makes the BBS valuable for monitoring functional change during rehabilitation, yet it does not validate the instrument as a comprehensive assessment of fall risk in neuropathic populations.[1,2,8] Instruments such as the MiniBEST or the Michigan Neuropathy Screening Instrument incorporate sensory domains and would likely demonstrate different relationships with clinical variables.[2]

Dietary status can influence balance through several biological pathways beyond glycemic control. Inadequate protein intake accelerates sarcopenia, reducing lower-limb strength and slowing postural reactions that are essential for maintaining stability. Deficiencies of vitamin D, B complex, and antioxidants have been linked to the progression of peripheral neuropathy and impaired nerve conduction, further compromising sensory feedback required for postural orientation. Malnutrition and loss of muscle mass also diminish the effectiveness of rehabilitation programs, highlighting the need for nutritional screening as part of balance management.[9–13]

These observations argue for an integrated assessment strategy. Reliance on a single motor scale risks underestimating impairment and may lead to inappropriate clinical decisions. Future studies should combine BBS with sensory examinations, structured fall history, and contextual information regarding illness severity, steroid exposure, and ICU care to achieve a multidimensional understanding of balance.[4,5,6]

Conclusion

The methods-validation analysis indicates that the Berg Balance Scale alone is not sufficient to represent the complex sensory-motor nature of balance impairment in diabetes. The scale reflects motor conditioning but lacks sensitivity to neuropathic sensory loss. Clinical evaluation and research in this field should employ combined protocols integrating motor and sensory instruments.

Limitations

1. Sensory measures and fall history were not available in the dataset.
2. HbA1c values were not available; classification of controlled versus uncontrolled diabetes could not be performed.

3. The residual influence of critical-illness neuropathy or steroid-induced glycemic fluctuations cannot be completely excluded.
4. The cross-sectional design precludes responsiveness analysis.

Clinical Implications

On the basis of current understanding of diabetic and postviral balance dysfunction, physiotherapy should employ a multicomponent intervention model rather than general exercise alone. Effective programs should include (1) proprioceptive retraining using joint-position matching, eyes-closed stance, foam-surface activities, and sensory reweighting drills to enhance somatosensory reliance; (2) taskspecific balance training such as tandem and single-leg stance, multidirectional reaching, obstacle negotiation, step-up/step-down practice, and turning strategies; (3) perturbation training to improve ankle-hip strategy switching and protective stepping; (4) strengthening of antigravity musculature, particularly ankle dorsiflexors, plantar flexors, quadriceps, and hip abductors, through closed-chain functional exercises; (5) gait rehabilitation on varied surfaces with speed modulation and dual-task challenges; and (6) aerobic conditioning to address deconditioning commonly seen after COVID-19.

Education regarding foot care, appropriate footwear, and glycemic optimization should accompany therapy to reduce neuropathic progression. Programs should progress using principles of overload and task specificity, with a minimum frequency of three sessions per week for 8–12 weeks. The BBS may be used to monitor functional changes, but the selection and progression of interventions should be guided by combined motor and sensory assessments rather than by the BBS score alone.[14,15]

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ORIGINAL RESEARCH ARTICLE

From Confidence to Competence: Embedding Critical GenAI Literacy in Physician Associate Education

Chanceeth Chandrakanthan[a], Julie Voce[b], Jane Secker[c,*], Tamara S. Ritsema[d], and Amy Donaldson-Perrott[c,†]

Submitted: 13-Jan-2026; Accepted: 22-Feb-2026

Abstract

Background: Generative artificial intelligence is now embedded in how many healthcare students learn. Tools provide rapid explanations, summaries, and practice questions, but use does not equal AI literacy, particularly where accuracy, medication safety, and guideline alignment matter.

Objective: To describe the current use of generative AI by Physician Associate students and outline a practical approach to teaching critical AI literacy.

Methods: The educational evaluation comprised three activities: (1) a baseline survey of students about use and attitudes, (2) an embedded compare-and-critique session in applied pharmacology, in which small groups assessed AI answers against trusted UK sources, including BNF and NICE guidance, followed by a short post session survey, and (3) reflective conversations with two students to contextualize use within problem-based learning.

Results: In the cohort survey (n = 40), use for learning was near universal (39 of 40, 98%). Most students were extremely confident using AI for learning (27 of 40, 68%) despite limited prior training (5 of 40, 13%). Students most valued summarizing complex topics (38 of 40) and generating revision questions (34 of 40). After the compare-and-critique session (n = 26), 24 of 26 (92%) reported greater awareness of the need to check accuracy and reliability when using AI or online resources. Students described using AI to reduce overwhelm and turn learning outcomes into manageable steps, while emphasizing verification against trusted sources across academic and clinical contexts.

Conclusions: Students are already using AI at scale. The educational priority is to help learners calibrate trust, verify outputs against credible sources, and preserve depth of understanding. A compare-and-critique session offers a scalable entry point, but AI literacy should be embedded across the curriculum and linked to professional judgement.

Introduction

Physician Associates (PAs) have been part of the UK health workforce for over 20 years and contribute to patient care across a wide range of settings, including community services, tertiary care, and mental health services.[1] Most UK PA programs are Level-7 Master's and typically require an undergraduate degree in a life science subject for entry.[2] Training is intensive, and many students find it challenging to adapt to the pace. They are expected to learn the pathophysiology of all body systems alongside pharmacology, clinical reasoning, and clinical skills while attending regular clinical placements. With the advent of generative artificial intelligence (GenAI), it is unsurprising that there has been rapid growth in students seeking tools to help them navigate these demands. GenAI can quickly generate explanations, summaries, revision questions, and study plans and can draft structured answers to learning objectives, which may appeal to students managing heavy workloads and placement commitments.[3]

Clinical educators at our institution, City St George's, University of London, have become increasingly concerned that some students may be using GenAI in ways that replace, rather than support, active learning. Tutors reported instances

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where students appeared to arrive with comprehensive notes and well-produced mind maps yet struggled to explain concepts, apply learning during discussion, or transfer knowledge into assessment performance. These observations raised concerns about surface learning masked by fluent outputs and about the risk of error when students use GenAI to save time without routinely checking accuracy.

GenAI is now firmly embedded in the study practices of many healthcare students, offering fast access to structured information and reducing the administrative burden of learning.[3] However, the ability to use GenAI tools is not synonymous with AI literacy.[4] A 2025 survey from the Higher Education Policy Institute reports near universal student use of AI, alongside ongoing uncertainty about what constitutes acceptable use in assessment and a gap between students' perceived need for AI skills and the support they receive from institutions.[5] In high-stakes healthcare contexts, limited critical appraisal can contribute to automation bias, where incorrect or incomplete outputs are accepted as reliable, potentially compromising information accuracy, and patient safety.[6,7] Students may feel confident using intuitive, app-like tools but still lack the discipline-specific judgement required to evaluate clinical content, recognize omissions, and align learning with national guidance.

GenAI in Healthcare Education

As educators, we wanted to understand how students were using GenAI and whether they were aware of potential pitfalls. We initiated three structured activities to inform and evaluate our curriculum response: a baseline cohort survey, an embedded Padlet (an online collaborative whiteboard: https://padlet.com/)-based teaching activity in prescribing with postsession feedback, and brief reflective conversations with two students. These conversations were used to produce anonymized student narratives to contextualize the survey findings rather than as a formal qualitative analysis. This approach is consistent with the Digital Education Council (DEC) AI Literacy Framework, which emphasizes contextualized AI literacy and evaluation of outputs against domain-specific standards to understand strengths and limitations.[8]

Recent evidence in health professional education highlights both opportunities and risks. A 2025 systematic review of GenAI use by health profession students reports that learners most commonly use GenAI for tasks that align with independent study, such as generating explanations, summarizing content, producing study materials, and creating practice questions.[3] The review also notes that collaborative learning applications are less common, which may increase the chance that fluent outputs are accepted without challenge or discussion unless verification behaviors are explicitly taught and expected.[3]

Alongside these benefits, recent work has raised consistent concerns about confident inaccuracies, omissions, lack of transparency about sources, and automation bias.[6,7] In clinical learning contexts, learners may accept plausible outputs as reliable, particularly when they are time pressured or when prompts are underspecified.[6] These issues are especially relevant in healthcare education, where small errors or missing safety critical details (such as contraindications, interactions, monitoring, or safety netting) can impact patient care.[6,7] There are also professionalism considerations, including confidentiality, data protection, and academic integrity, which require clear program expectations and safe study guardrails.[6,7]

Encouragingly, there are emerging examples of curriculum responses that move beyond one-off training. For example, course-level approaches in nursing education describe embedding GenAI literacy across modules, with repeated opportunities for learners to practice critique, source evaluation, and transparent use.[9] Taken together, the recent literature supports a shift from reactive restriction toward structured, iterative integration of GenAI literacy, with verification and professional judgement treated as core clinical learning skills rather than optional additions.[8]

AI Literacy Frameworks That Can Inform Curriculum Design

Several frameworks provide useful scaffolds for integrating GenAI into teaching. The DEC AI Literacy Framework emphasizes the evaluation of AI outputs and introduces the idea of domain expertise, meaning that learners must be able to apply AI responsibly within discipline-specific standards.[8] In healthcare education, this maps directly to verifying outputs against authoritative guidance and recognizing when context changes the correct answer.

The Open University Critical AI Literacy framework foregrounds criticality as a social practice and is explicitly rooted in equality, diversity, inclusion, and access (EDIA).[10] It highlights that power and bias shape what is produced and what is treated as knowledge, and it encourages learners to examine who benefits and who is marginalized by digital systems.

Sector guidance, such as the Russell Group principles on the use of generative AI tools in education, emphasizes that students and staff should be supported to become AI literate, that teaching and assessment should adapt, and that academic rigor and integrity must be upheld.[11]

Across these frameworks, a common theme is that responsible GenAI use requires more than tool familiarity. It requires critical judgment, verification, and clear professional guardrails.

Aim and Research Question

1. What are physician-associated students' patterns of GenAI use, confidence, and prior AI literacy training at the start of the program?

2. How do students describe the impact of an embedded, discipline-specific, compare and critique activity on their approach to verifying and critiquing GenAI outputs?

Methods

Design

We conducted an educational evaluation within a UK PA program of a single cohort at the end of the first month of the program ($n = 46$). We used three connected activities, presented in the order they occurred: cohort survey, embedded teaching activity with post-session survey, and brief reflective conversations with two students that were written up as anonymized student narratives.

1. Cohort survey *(Baseline)*

An anonymous 24-item survey was administered via Microsoft Forms to capture students' experiences of using AI for learning, including baseline adoption, frequency of use, and self-rated confidence (Appendix). Students were invited to complete the survey in the first week of the course before any curricular activities that explicitly embedded AI literacy had taken place. Forty of 46 students responded (87%). Survey items were drafted by the teaching team following completion of the Future Learn AI in Education course with King's College London and ongoing GenAI upskilling. A colleague with publication experience reviewed the draft survey and refined wording for clarity and face validity. The survey also asked whether students would be willing to take part in an informal discussion about their use of GenAI.

2. Embedded compare and critique activity and post-session survey *(2 weeks later)*

A 30-minute Padlet-based exercise was embedded into a cardiovascular pharmacology session. Students were divided into six groups and asked to answer 10 pharmacology questions. Groups were allocated at random to either a GenAI-only condition or a non-AI condition by splitting the class into two halves (three groups in each condition). The GenAI groups used generative AI tools only, while the non-AI groups used non-AI resources only, including the BNF, NICE guidance, the Top 100 Drugs book, BMJ resources, and standard course learning materials. The activity was designed to support accuracy checking, source evaluation, and collaborative critique skills, aligned with safe medicine management learning outcomes displayed in the session materials.

To support comparison, the Padlet board used private breakout rooms so groups could not see the answers of other groups during the task. The generative AI groups were encouraged to use platforms they already felt comfortable with to reflect real-world learner behavior. The non-AI groups were required to record the source for each answer within their Padlet post. After 30 minutes, the Padlet board was published and used for a further 30-minute facilitated whole-class review.

The design aimed to shift students from accepting a polished output to actively verifying and challenging responses, using uncertainty as a prompt for discussion and checking.

Following the session, a targeted feedback survey was delivered via Microsoft Forms to capture students' perceptions of the activity's impact on their clinical appraisal and verification behaviors. Twenty-six of 46 students completed the post-session survey (56.5%).

3. Student narratives *(9 weeks from baseline)*

Two students were invited to share their experiences of using AI to support preparation for problem-based learning (PBL) sessions. These are weekly facilitated sessions in groups of 8 to 10 students, where learners work through a clinical case together. Each case generates approximately 10 to 20 learning objectives for preparation before the next session, with an anticipated workload of approximately 5 to 6 hours. The baseline cohort survey invited students to volunteer for a brief reflective conversation about their use of GenAI. Two students were selected at random from those who volunteered, reflecting staff capacity. Notes were recorded during the conversations and used to produce anonymized student narratives. These narratives are presented to contextualize the survey findings and are not intended as a formal qualitative analysis.

Analysis

We summarized closed survey items using descriptive statistics. Free text responses were reviewed for recurrent issues relevant to AI literacy, including confidentiality, accuracy, overreliance, and verification behaviors. Notes from the reflective conversations were used to create anonymized student narratives, presented to contextualize the survey findings rather than as a formal qualitative analysis.

Ethical and Governance Considerations

This work was conducted as an educational evaluation of routine teaching. A formal research ethics review was not sought. Survey responses were anonymous. Students were reminded not to input patient-identifiable information into GenAI tools. No patient information was collected as part of this evaluation. Participation was voluntary, and nonparticipation did not affect teaching or progression. The survey required responses to all items to students who preferred not to answer could choose not to participate.

Results

Cohort Survey

In the baseline survey ($n = 40$), 39 of 40 students (97.5%) reported having used a GenAI tool. Most students described frequent use: weekly (15 of 40) and daily (9 of 40) were common. Confidence was high: 27 of 40 (67.5%) reported being very or extremely confident in using GenAI effectively for learning. GenAI literacy training exposure was low: only 5 of 40 (12.5%) reported any prior formal or informal training.

Baseline cohort survey responses are summarized in Table 1.

Table 1 Key Baseline Cohort Survey Responses ($n = 40$)

Measure	*n* (%)
Ever use an AI tool	
Yes	39 (97.5)
No	1 (2.5)
Frequency of AI tool use	
Weekly	15 (37.5)
Daily	9 (22.5)
Rarely	8 (20)
Monthly	7 (17.5)
Confidence using AI for learning	
Extremely confident	14 (35)
Very confident	13 (32.5)
Slightly confident	10 (25)
Not confident	3 (7.5)
Training in using AI tools	
No, I haven't had any training	35 (87.5)
Yes, formal training (e.g., course, workshop, structured teaching)	3 (7.5)
Yes, informal training (e.g., self-taught, peer learning, online resources)	2 (5)
Do you believe AI tools can enhance your learning in this course?	
Yes	29 (72.5)
Unsure	10 (25)
No	1 (2.5)
Most valued uses (select up to three)	
Summarizing complex topics	38 (95)
Generating revision questions	34 (85)
Supporting learning	18 (45)
Practicing clinical reasoning	10 (25)

Students believed GenAI could enhance their learning (29 of 40, 72.5%). When asked which uses would be most valuable (select up to three), students most commonly chose summarizing complex topics (38 of 40), generating revision questions (34 of 40), supporting learning (18 of 40), and practicing clinical reasoning (10 of 40).

Free text responses highlighted perceived risks and ethical concerns. These included confidentiality and privacy, inaccuracy and hallucinations, misalignment with UK guidance, overreliance, and academic integrity concerns.

Embedded Session and Post-Session Survey

The post-session survey was completed by 26 of 46 students (56.5%). Most respondents found the Padlet group activity engaging, with 24 of 26 rating it as very or extremely engaging. After the activity, 24 of 26 (92.3%) reported that it helped them appreciate the importance of checking accuracy and reliability when using generative AI or other online resources. Students also described the activity as helpful for making limitations visible, particularly omissions and overly confident phrasing.

During the facilitated debrief, students identified a safety-relevant error within a generative AI-generated response. For the question asking whether to choose an angiotensin converting enzyme (ACE) inhibitor or an angiotensin II receptor blocker for an adult of African and Caribbean family origin, the generative AI only group response recommended an ACE inhibitor and presented this as aligned with NICE guidance. Students using non-AI sources challenged this and confirmed that NICE guidance advises considering an angiotensin II receptor blocker in preference to an ACE inhibitor in adults of African and Caribbean family origin. This example was used to reinforce the need to verify generative AI outputs, even when they are fluent and cite reputable sources.

Student Narratives

Student Narrative 1: Managing workload in PBL preparation

Both students described using GenAI at the start of PBL preparation to translate a long list of learning objectives into manageable steps, which reduced feelings of being overwhelmed.

Student Narrative 2: GenAI as a starting point, with verification

Both students described treating GenAI output as a starting point rather than an authority and emphasized verification against trusted sources, particularly for management pathways and medicine information.

Discussion

From Confidence to Competence

Our data show a clear confidence and training gap. Most students are confident in using GenAI for learning, yet few report prior training. This mirrors wider digital literacy work, distinguishing tool confidence from digital competence and accountability, where confident use can still coexist with poor judgement about reliability, ethics, and downstream consequences.[5,12] In Jisc's 2024/25 UK higher education students digital experience insights survey, 34% of students reported using AI tools as part of their learning, while only 23% reported being provided access to AI platforms by their institution. Students also called for clearer guidance and consistent messaging about reliability and academic integrity, and only a minority reported being provided access to institutional AI platforms.[13] The persistent narrative that today's learners are "digital natives" can further widen this gap by encouraging assumptions that familiarity with technology equates to strong information evaluation and critical judgment. However, evidence reviews challenge the idea of a generationally uniform, naturally digitally skilled student body and show substantial variation in learners' digital and information skills, with no guarantee that growing up with technology produces reliable critical evaluation or effective multitasking.[14,15] In healthcare education, this matters because it can shape the quality and safety of the knowledge and habits that students carry into clinical practice.

Educator Role and Professional Development

Embedding GenAI literacy into teaching is also an educator capability issue. Students' verification habits, prompt choices, and willingness to critique outputs are shaped by what staff model and what is required within learning activities and assessment. Rodger et al emphasize this dependency, noting that "many educators lack the necessary AI literacy" and arguing that time and resources are needed to equip educators alongside students."[16] This reinforces that expectations placed on students need to be matched by institutional investment in educator development and clear guidance.

In our case, two authors completed EDM122, Digital Literacies and Open Practice, a module within the MA in academic practice at City St George's, University of London. This provided structured time to engage with digital literacy and critical perspectives that shaped the selection and use of the frameworks applied in this paper. Secker's account of EDM122 describes how the module links digital literacies with openness and ethical engagement rather than treating digital skills as purely technical.[17] Secker and Voce describe how accredited development supported staff during the digital pivot, reinforcing the value of sustained educator learning when practice and expectations change quickly.[18] Related work on staff digital literacies also argues for moving beyond short skill-based inputs toward more critical, evidence-informed development and notes how the "digital native" narrative can negatively shape staff confidence.[19]

Why Verification Should Be Taught Explicitly

As highlighted by the student narratives, students described checking GenAI outputs against trusted sources, but relying on individual trial and error is likely to produce uneven practice across a cohort. Research on how learners evaluate online information suggests that, without explicit teaching, people often judge content at face value or rely on superficial cues rather than systematically assessing source credibility. Teaching lateral reading, leaving an unfamiliar source to corroborate it elsewhere, has been shown to improve digital evaluation and fact-checking strategies.[20,21] However, evidence from authentic educational settings suggests that short, standalone misinformation interventions may not lead to sustained use of verification strategies over time, supporting the case for repeated, curriculum-embedded reinforcement rather than a single reinforcement.[22] In healthcare education, the need for explicit verification is compounded by the difficulty of detecting errors in fluent AI output. A study of general practice trainees suggested that reliably detecting hallucinations in ChatGPT-generated clinical responses requires explicit training, supporting the view that verification is a learned capability rather than an assumed default.[23] The Open University digital and information literacy framework is useful here because it makes progression in locating information and critically evaluating sources explicit, aligning closely with verification tasks when students use GenAI outputs to support learning.[24]

Making Bias and Access Visible

The Open University Critical AI Literacy framework adds an EDIA lens that is particularly relevant in healthcare. GenAI systems can reproduce biases present in training data and can present assumptions as neutral facts.[16] Helping students to ask who is represented, who is missing, and who may be harmed by biased outputs supports epistemic justice and better patient care.

Moving Beyond Prohibition

Given near-universal student use, a prohibition stance is unlikely to be effective. The Russell Group principles emphasize that universities should support students and staff to become AI literate and should adapt teaching and assessment

accordingly. In PA education, this suggests embedding GenAI literacy into routine learning activities, clarifying confidentiality boundaries, and making expectations around transparency and academic integrity explicit. National student survey findings also suggest that students want clearer direction and support from institutions, reinforcing the need to shift from reactive restriction toward structured literacy development.[5]

Curriculum Implications

Short comparison and critique activities can be embedded across modules where GenAI use is possible. Key design principles include (1) making verification visible, (2) requiring evidence from authoritative UK sources, (3) teaching prompt literacy as a clinical skill, (4) normalizing limitations and uncertainty, and (5) ensuring equitable access to training. In the UK context, this aligns with Health Education England's digital capability framing, which explicitly includes the ability to find, interpret, and critically evaluate information and its sources, alongside safe and professional digital practice.[25]

Limitations and Next Steps

This evaluation was conducted within one program by one cohort, and we may not have captured actual behavior in the cohort survey due to self-reporting bias. Additionally, the post-session survey could capture only perceived learning and engagement rather than objective changes in verification skill. Finally, the student narratives were based on brief reflective conversations with two students and are presented as illustrative examples to provide contextual insight rather than represent all learners.

The next steps could include repeating the evaluation across cohorts, introducing a short spiral curriculum for GenAI literacy across modules, and assessing whether students demonstrate improved verification behaviors in written work and viva-style discussions.

Conclusion

GenAI is already part of PA students' learning, and our cohort demonstrated high confidence despite a lack of formal training. A single, standalone activity such as our Padlet session can make verification behaviors visible and create a useful starting point, but it is not sufficient on its own. What is needed is iterative integration of GenAI literacy across the curriculum, with repeated opportunities to practice verifying outputs against credible sources, calibrating trust, and applying professional judgment in different clinical contexts. This aligns with the DEC emphasis on contextualized AI literacy and evaluation against domain standards, the Open University Critical AI Literacy focus on criticality, power, and equity, and critical digital literacy scholarship frames evaluation and identity as essential learner resources.[8,10,26] UK capability frameworks provide a practical basis for specifying progression and expectations across a program, rather than relying on optional or ad hoc training.[25,27]

Ethics Approval

Ethical oversight and consent procedures are described in the manuscript. Data were collected as part of an educational evaluation of routine teaching, with participation voluntary.

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Appendix

Baseline Survey: Physician Associate Student Experiences and Attitudes Toward AI

Section 1: Background and Experience

1. What year of the course are you on?
   - Year 1
   - Year 2
2. Have you ever used an AI tool (e.g., ChatGPT, Bard, Claude, Copilot, or others)?
   - Yes
   - No
3. If yes, please specify which ones:
   [Free text]
4. How long have you been using AI for learning?
   - Less than 3 months
   - 3–12 months
   - More than a year
   - 1–3 years
   - More than 3 years
   - Never
5. How long have you been using AI for personal (nonlearning) use?
   - Less than 3 months
   - 3–12 months
   - More than a year
   - 1–3 years
   - More than 3 years
   - Never
6. Approximately how frequently do you currently use AI tools?
   - Daily
   - Weekly
   - Monthly
   - Rarely
   - Never
7. In what contexts have you used AI? (Tick all that apply)
   - Academic work (e.g., writing, research, revision)
   - Clinical learning or practice
   - Personal use (e.g., productivity, creative projects)
   - Previous employment
   - Other
8. Which AI tool is your favorite and why?
   [Free text]
9. Have you paid for access to any AI tools?
   - Yes – I have subscribed to one or more paid AI tools
   - Yes – I have made one-time payments
   - No – I only use free versions
   - No – I do not use AI tools
10. Do you feel the cost of paid AI tools is a barrier to your use of them?
    - Not a barrier – I can afford the versions I need
    - Somewhat a barrier – I would like to use paid versions but limit myself
    - A significant barrier – cost prevents me from using AI tools as I would like

    - Not applicable – I do not use AI tools
11. Do you identify as neurodivergent?
    - Yes
    - No
    - Prefer not to say
12. Can you share any ways in which AI tools have been particularly supportive or unhelpful for you as a neurodivergent learner?
    [Free text]

Section 2 – Confidence and Understanding

13. How confident do you feel in your ability to use AI tools effectively for learning or educational purposes?
    - Extremely confident
    - Very confident
    - Slightly confident
    - Not confident
14. Have you received any formal or informal training in the use of AI tools?
    - Yes, formal training (e.g., course, workshop, structured teaching)
    - Yes, informal training (e.g., self-taught, peer learning, online resources)
    - No, I have not had any training
15. If yes, please describe the type of training you have received.
    [Free text]

16. I understand the benefits and limitations of AI tools in education
    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree
17. I understand the strengths of AI tools in healthcare
    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree
18. I understand the limitations and risks of AI (e.g., bias, inaccuracy, confidentiality).
    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree
19. Please list one or more limitations or risks of AI you are aware of.
    [Free text]

Section 3 – Perceptions of AI in Learning

20. Do you believe AI tools can enhance your learning in this course?
    - Yes
    - No
    - Unsure
21. Please explain your answer.
    [Free text]
22. Which of the following potential uses of AI in your studies would you find most valuable? (Select up to three)
    - Summarizing complex topics
    - Practicing clinical reasoning
    - Generating revision questions
    - Supporting learning
    - Enhancing academic writing
    - Other
23. What concerns, if any, do you have about using AI in your learning or future clinical practice?
    [Free text]

Section 4 – Ethical and Professional Awareness

24. I understand the potential ethical issues for the use of AI in healthcare (e.g., patient safety, data privacy, accountability).
    - Strongly agree
    - Agree
    - Neutral
    - Disagree
    - Strongly disagree
25. Briefly describe one or more ethical concerns you are aware of.
    [Free text]
26. In your opinion, what role (if any) should AI play in the education of future physician associates?
    [Free text]
27. Would you be interested in dedicated teaching sessions on how to use AI responsibly in healthcare?
    - Yes
    - No
    - Unsure
28. Would you be interested in dedicated teaching sessions on how to use AI responsibly in learning?
    - Yes
    - No
    - Unsure
29. Optional: You may leave your name if you are willing to be contacted for focus group discussions.
    [Free text]

REVIEW ARTICLE

Navigating the Genetic Frontier: Clinical and Ethical Implications of Free Genetic Testing in India

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Abstract

The expansion of free genetic testing services in India, resulting from government policies such as the Ayushman Bharat Digital Mission, corporate-sponsored initiatives, and international collaborations make it easier to access genomic services for the early identification of inherited disorders such as thalassemia, sickle cell anemia, and certain genetic kidney diseases, particularly in tribal populations. However, this review reveals significant clinical and ethical challenges. Clinically, Western-based genotyping platforms, not tailored to India's genetic diversity, risk inaccurate results, including false positives and negatives, complicating clinical decision-making. A shortage of genetic counselors and inadequate posttest care leaves patients, especially in rural areas, struggling within fragmented healthcare systems, worsening inequities. Ethically, informed consent is often compromised in low-literacy settings due to cultural and linguistic barriers, raising concerns about autonomy. Data privacy is a critical issue, with India's incomplete regulatory framework—marked by the stalled DNA Technology Regulation Bill and revisions to the Personal Data Protection Bill—leaving genomic data vulnerable to misuse. Hidden costs, such as follow-up diagnostics, burden low-income families, while societal risks include potential stigmatization in marriage and family planning. Regulatory gaps allow inconsistent standards across providers, necessitating a unified policy framework.

Recommendations include integrating genetic testing into the National Health Policy with robust guidelines on validation, consent, and data governance, alongside training for physician associates to ensure ethical, patient-centered care. Addressing these challenges is crucial for the equitable and responsible implementation of free genetic testing in India's diverse population.

Keywords Genetic testing, India, Ethics, Informed consent, Data privacy

Introduction

Background and Context

The landscape of genetic testing in India is rapidly evolving, marked by a growing number of no-cost testing programs introduced by private entities, international collaborators, and national schemes such as the Ayushman Bharat Digital Mission.[1,2] These services aim to identify inherited disorders such as thalassemia, sickle cell anemia, and genetic kidney diseases, particularly among tribal communities and vulnerable populations.[3–5] While promoted as equitable and inclusive, such programs often lack the clinical robustness and ethical safeguards required for responsible implementation.[2,6] Challenges related to data protection, inadequate counseling, and unregulated access continue to raise concerns within the healthcare community.

Purpose and Scope

This review aims to explore the complex interplay between accessibility and responsibility in the context of free genetic testing in India. While these programs may offer equitable diagnostic opportunities, they may also lead to unintended consequences if essential safeguards—such as informed consent, clinical validation, and posttest care—are insufficient.[7–9]

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Additionally, expanding such services often reflects global influences and commercial interests rather than the specific needs of the Indian population, potentially creating new disparities in care delivery.[10–12] This review examines how these concerns affect clinical outcomes, health system integration, and patient autonomy.[13–15]

Relevance

For physician associates who operate at key points within India's primary and secondary healthcare systems, a thorough understanding of the ethical and clinical dimensions of genetic testing is vital. Their role in guiding patients, ensuring ethical standards, and interpreting results responsibly will be instrumental in achieving equitable and patient-centered implementation.[16–18]

Understanding Free Genetic Testing in India

Definition and Models

The concept of free genetic testing in India encompasses a range of delivery systems shaped by varying objectives: public health, corporate engagement, and research interests. These models operate under different mechanisms, each influencing how individuals access and experience testing.

One of the leading approaches is the government-supported model seen in initiatives such as the Ayushman Bharat Digital Mission. This scheme aims to embed genetic services into the broader digital healthcare infrastructure, focusing on early detection of hereditary disorders such as thalassemia and sickle cell anemia—conditions often concentrated in tribal and socially disadvantaged communities. The objective is to integrate preventive screening into routine care, reducing long-term disease burden.[1,2]

Another prominent model is corporate-sponsored genetic screening, where private employers or insurance-linked wellness programs offer free testing to employees or selected communities. While such offerings promote preventive care, they often involve conditions requiring individuals to agree to the collection and future use of anonymized genetic data. These arrangements raise critical questions around the transparency of consent, data ownership, and the potential for commercial exploitation of personal information.[6,13]

A third and increasingly relevant model involves data-sharing collaborations between Indian diagnostic companies and global research entities or pharmaceutical corporations. In these partnerships, genetic tests are provided at subsidized or zero cost, often in exchange for access to genomic data that supports international research or product development. For instance, a hypothetical alliance between an Indian biotech firm and an overseas drug developer might provide low-cost screening in rural districts while leveraging the collected data for global health research or commercial innovation.[11,14]

While these models improve the visibility and accessibility of genetic testing, they also present variability in terms of clinical standards, ethical regulation, and service integration. Without uniform oversight and standardized safeguards, there is a risk of inconsistent counseling, unclear data governance, and limited accountability, as shown in Table 1. Establishing a cohesive regulatory structure is essential to ensure both scientific reliability and ethical responsibility.

Accessibility and Adoption

Although free genetic testing is expanding in India, its reach remains uneven due to longstanding socioeconomic and infrastructural gaps. Urban areas, with their stronger healthcare systems, digital connectivity, and higher health literacy, are more likely to benefit from such programs. Access in these regions is also facilitated by stronger public–private partnerships and the presence of specialized laboratories and personnel.[17,19]

In contrast, rural and remote areas, where the prevalence of inherited diseases is often higher, struggle with poor infrastructure, digital exclusion, and a shortage of trained healthcare professionals exist as shown in Fig. 1. These factors create significant barriers to access, especially for populations that might benefit most from early diagnosis.[2,17]

To bridge this divide, initiatives such as mobile diagnostic units and telemedicine services have been deployed to bring testing and counseling to underserved regions. Mobile units are equipped for sample collection and basic consultations and operate in collaboration with district-level health facilities. Telehealth platforms allow

Table 1 Comparison of Free versus Clinical Genetic Testing in India

Feature	Free Genetic Testing	Clinical Genetic Testing (e.g., AIIMS, CMC)
Cost to patient	Free or low cost	Patient funded or insurance covered
Test validation	Often nonstandardized, Western-based platforms[3,4]	Validated for Indian population-specific variants[5]
Counseling availability	Rare or absent[2,14]	Provided by certified professionals[2,5]
Follow-up services	Limited or none[2,5]	Structured and integrated[5]
Data use transparency	Often unclear; data monetization common[6,13]	Regulated within clinical care protocols[5]
Access	Variable; urban centric[2,17]	Concentrated in tertiary centers

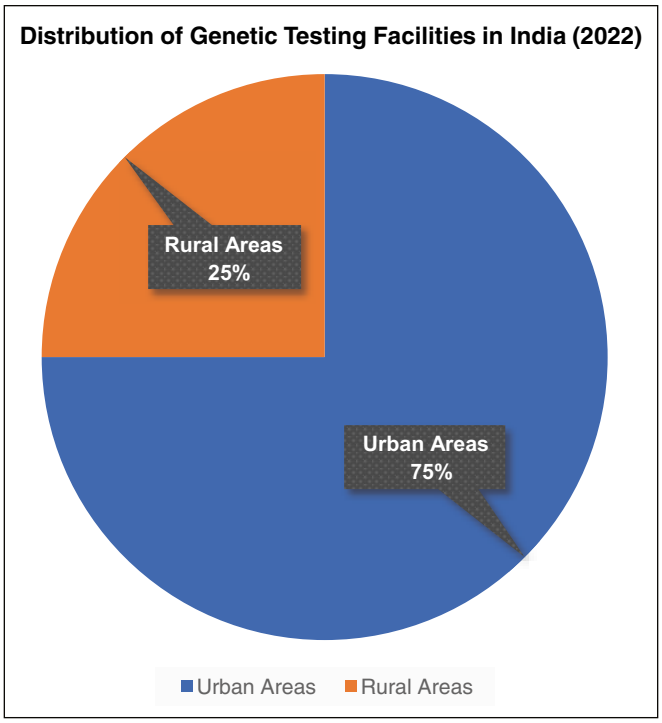

Figure 1 Pie chart of genetic testing access by urban versus rural region

specialists to guide patients remotely, helping overcome geographical limitations.[2,13]

However, challenges persist beyond infrastructure. In many communities, awareness of genetic testing remains low, and misconceptions, mistrust, and stigma are common. Concerns about misuse of genetic data and potential discrimination may discourage participation.[6,8] Additionally, informed consent is often superficial, particularly in low-literacy settings where patients may not fully understand the implications of testing.

For these services to be effective, context-sensitive public engagement is crucial. Training community health workers and physicians to communicate genetic concepts clearly and respectfully can help build trust and encourage informed participation. Such measures are vital to ensure ethical and inclusive adoption of genetic services across diverse populations.

Clinical Considerations

Accuracy and Reliability

One of the primary concerns surrounding free genetic testing in India is the inconsistency in test accuracy, particularly given the country's exceptional genetic diversity. India is home to thousands of endogamous communities, each with unique genetic lineages and mutation patterns. However, many of the commercial or free testing services currently available in the country rely on genotyping platforms developed using datasets from predominantly Western populations.[3,4] These standardized tests often fail to account for Indian-specific genetic variants, which can result in false positives, false negatives, or findings of uncertain clinical significance.

This lack of sensitivity to population-specific mutations poses significant risks to clinical decision-making. Incorrect results may lead to unnecessary anxiety or inappropriate medical interventions, while missed mutations may delay treatment or preventive care.[4,5] In contrast, tertiary healthcare institutions such as AIIMS and CMC Vellore use diagnostic platforms that incorporate region-specific variant databases and follow stringent laboratory protocols, thereby achieving a much higher degree of clinical validity.[5]

The contrast between these settings underlines the urgent need for validation of testing platforms in the Indian context. Without population-specific calibration, the promise of free genetic testing may be undermined by unreliable outcomes, leading to distrust among patients and practitioners alike.[4,5]

Interpretation and Follow-Up

Accurate interpretation of genetic test results is as important as the test itself. However, in India, the infrastructure to support this crucial step is severely limited. There is a notable shortage of qualified genetic counselors, particularly outside urban centers. Consequently, the task of explaining test outcomes often falls to general practitioners or physician associates, many of whom may not have specialized training in genomics.[2,14] This can result in misunderstandings, incorrect clinical assumptions, or psychological distress for patients, especially when the results are ambiguous or include variants of unknown significance.[2,13]

Furthermore, many free testing programs operate in isolation and do not include provisions for posttest counseling or structured follow-up. Once results are delivered, patients are frequently left to navigate complex healthcare systems on their own. The responsibility for confirmatory diagnostics and ongoing care often shifts to an already overburdened public health system, which cannot absorb these additional demands.[2,5] Without integrated care pathways that link testing, counseling, and treatment, patients are at risk of receiving fragmented care, or none at all.[5] This gap highlights the need for coordinated infrastructure that supports the full continuum of genetic services, from testing to long-term clinical management.

Health System Impact

While valuable in principle, the proliferation of free genetic testing carries the risk of placing unsustainable pressure on India's healthcare infrastructure. As more individuals receive test results indicating genetic risk or unknown variants, the demand for specialist consultations, diagnostic confirmations,

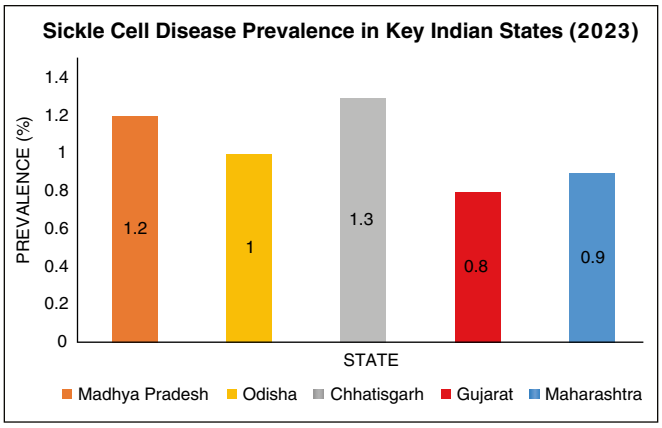

Figure 2 Bar chart of sickle cell disease prevalence in key Indian states

and clinical interventions is expected to rise dramatically.[2,19] The current health system, already stretched by resource constraints and workforce shortages, may struggle to keep up.

This concern is particularly acute in tribal and under-resourced regions, such as central India, where the prevalence of inherited conditions such as sickle cell anemia is significantly higher, as shown in Fig. 2.[3,12] While expanding access to genetic testing in these areas is essential, doing so without investing in treatment capacity risks creating diagnostic bottlenecks. In these regions, an influx of new diagnoses could exceed the capacity of local health services, worsening existing disparities in healthcare access.[19]

To mitigate these challenges, the expansion of genetic screening must be matched by investments in clinical infrastructure, workforce training, and referral systems. Without such systemic support, the increased identification of genetic conditions may strain an already fragile system further.

Ethical Considerations

Informed Consent and Autonomy

Informed consent is essential to ethical healthcare delivery, yet its execution within free genetic testing program in India is often compromised, especially in rural and underserved regions. Low literacy levels, limited awareness of genetic science, and language diversity hinder individuals from fully understanding the purpose, risks, and long-term implications of testing. As a result, many participants may sign consent forms without truly comprehending the information provided.[6,8]

In communities with little access to formal education, such as tribal populations, the concept of autonomy is further challenged by cultural beliefs and power dynamics. When testing is introduced with the promise of free diagnostics or health benefits, individuals may feel obliged to participate, mistaking research efforts for clinical care. This creates ethical tensions between beneficence and respect for autonomy, particularly when consent is obtained without meaningful dialogue or cultural sensitivity.[6,14]

Moreover, free testing campaigns targeting economically vulnerable populations risk exploiting their lack of resources. Offering high-tech services without adequately explaining how data will be used or what support will follow can lead to participation under misleading premises.[8,14] Ethical practice requires transparent, local-language communication and the inclusion of culturally appropriate counseling to uphold autonomy and minimize coercion.

Privacy and Data Security

As genetic information becomes digitized and increasingly integrated into health records, protecting such sensitive data presents a serious ethical challenge. India's legislative framework for genetic privacy remains incomplete. The DNA Technology (Use and Application) Regulation Bill, proposed in 2018, has not yet been implemented, and ongoing revisions to the Personal Data Protection Bill (2023) highlights the uncertainty in legal protections, as shown in Table 2.[2,6] This regulatory gap is particularly concerning in the context of free testing offered by private companies or international collaborators. Many of these services collect large volumes of genomic data, often for secondary use in research or commercial analysis. Without clear safeguards, individuals may not know how their data will be stored, for how long, or with whom it will be shared.[6,13]

The rapid growth of digital health platforms in India has also increased vulnerability to data breaches. Inadequate cybersecurity measures, insufficient consent protocols, and a lack of enforcement mechanisms leave individuals exposed to misuse

Table 2 Summary of Ethical Challenges and Proposed Solutions in India

Ethical Challenge	Key Concern	Suggested Solution
Informed consent	Low literacy and linguistic barriers[6,8]	Use of culturally adapted local language consent tools[6,8,14]
Privacy and data security	Risk of data misuse; weak laws[2,6,13]	Enactment of the PDP Bill and the DNA Technology Bill[2,5,6]
Equity and exploitation	Data collection without benefit to communities[2,6]	Community engagement and benefit-sharing mechanisms[6,11]
Stigma and discrimination	Risk of caste/marriage-based exclusion[2,14]	Confidentiality assurance and counseling protocols[2,14]

or unauthorized access to their genetic information. These risks may have dire consequences, including discrimination in insurance, employment, or future medical care.[2,13]

Equity and Justice

While free genetic testing aims to expand access, its benefits are often unequally distributed. Urban populations, with greater access to healthcare infrastructure and digital tools, are more likely to receive these services than their rural counterparts. Meanwhile, marginalized communities may remain excluded due to logistical barriers or a lack of awareness.[17,19]

Furthermore, when underprivileged groups are primarily engaged as data sources for genetic research—without equitable return in the form of healthcare access or community benefit—issues of justice arise. These populations often contribute valuable genetic data yet rarely see improvements in local health services or infrastructure as a result.[2,6]

To address these imbalances, policies must focus on inclusive outreach, ethical governance, and fair distribution of research benefits. Equity must be built not only into who receives testing but also into who controls data and gains from its application.

Economic and Societal Implications

Hidden Costs

Although marketed as "free," genetic testing programs in India often involve indirect and downstream costs that patients must bear themselves. One of the most common financial burdens is the cost of follow-up diagnostics or confirmatory testing, which is typically not included in initial screening packages. Once a variant or risk factor is identified, patients may be referred for additional clinical investigations or treatment, which are not subsidized by the testing provider. These expenses can be substantial for families already grappling with limited access to healthcare resources.[2,5]

Moreover, patients may face nonmonetary costs, such as time lost in traveling to referral centers, anxiety over uncertain results, or disruption of family dynamics following ambiguous genetic findings.[2] These burdens often remain unacknowledged in the public discourse surrounding free testing but have real economic implications, particularly for low-income and rural families who are already disadvantaged in terms of healthcare access.[2,5]

Another dimension of hidden costs lies in the business models of private Indian startups offering genetic testing. Many such ventures operate on a "freemium" model—offering initial testing at no cost while profiting from data monetization, algorithmic insights, or secondary commercial partnerships with pharmaceutical companies.[6,13] These models often leverage patient genomic data to build proprietary databases or predictive tools that are subsequently sold or licensed, sometimes without adequate disclosure to the test recipients.[6,13] As a result, while the individual receives free testing, the real value is extracted from the data, often with limited accountability or benefit sharing.

Societal Perception

Beyond financial implications, free genetic testing also influences social perceptions of health, identity, and heredity in the Indian context. India's complex sociocultural fabric, deeply intertwined with caste, community, and familial lineage, creates fertile ground for the misinterpretation or misuse of genetic information. There is growing concern that increased access to genetic data may unintentionally reinforce caste-based or ethnic stereotypes, particularly if certain communities are found to have higher genetic susceptibility to conditions.[6,14]

This perception may further affect marriage prospects and reproductive decisions, particularly in communities that prioritize genetic "purity" or view health risks as familial liabilities.

Stigmatization can arise even from the knowledge of being a carrier of a recessive condition, leading to social exclusion or diminished matrimonial desirability.[2,14] In some instances, families may withhold testing or results from extended relatives to avoid reputational harm, thereby undermining the benefits of cascade screening or early intervention.

In a society where marriage and family planning are closely monitored by extended kin networks, the social fallout of genetic information can extend far beyond the individual. Misuse of data in such contexts risks reinforcing discrimination, particularly if the results are disclosed without proper counseling or community engagement.

To address these challenges, it is essential to integrate ethical and cultural sensitivity into genetic testing frameworks. This includes ensuring confidentiality, offering appropriate counseling, and proactively preventing social misuse of genetic information.

Regulatory and Policy Perspectives in India

Current Frameworks

The regulation of genetic testing in India remains fragmented, particularly in the context of emerging models that offer free or subsidized services. The Indian Council of Medical Research (ICMR) has issued guidelines on genetic testing, most recently updated in 2025, which emphasize quality assurance, informed consent, and the ethical use of genetic data, as shown in Table 3. These guidelines recommend the

Table 3 Overview of Key Indian Regulations on Genetic Testing

Regulation/Guideline	Year	Focus Area	Status
ICMR Guidelines for genetic testing	2025	Quality control, informed consent, counseling[3,5]	In effect
DNA Technology (Use and Application) Bill	2019	Data privacy, forensic use, consent for DNA use[2,6]	Withdrawn in 2023
Digital Personal Data Protection (DPDP) Bill	2023	Protection of personal/genomic data[2,6]	In effect from 2025
National Essential Diagnostics List	2019	Inclusion of genetic testing in public health labs[4]	Limited implementation

use of certified laboratories, the involvement of trained counselors, and transparency in testing protocols [3,5]

Despite these formal frameworks, significant gaps in oversight persist, especially regarding free testing offered by private firms or through public-private partnerships. These entities often fall outside the purview of direct regulatory enforcement, particularly when services are not classified explicitly as clinical or diagnostic. As a result, many providers operate without meeting appropriate standards for test validation, counseling, or data protection.[2,6]

Furthermore, although legal instruments such as the DNA Technology (Use and Application) Regulation Bill were introduced to mitigate the misuse of genetic data, it was withdrawn in 2023 and has not been passed in Parliament. In contrast, the Digital Personal Data Protection (DPDP) Bill, introduced in 2023, focuses on the protection of personal and genomic data. This bill was fully operationalized in November 2025, offering greater privacy safeguards for genetic information.[2,6] The lack of a unified regulatory body to oversee all forms of genetic testing—particularly those marketed as free—has led to inconsistent practices and ethical ambiguity. As genetic testing expands under diverse public and private platforms, India's existing policy landscape must evolve to ensure transparency, accountability, and patient-centered safeguards.

Recommendations

To address current regulatory shortcomings, genetic testing should be formally incorporated into India's National Health Policy with clearly defined ethical and clinical guidelines. Policy revisions should establish regulatory mechanisms applicable to both government-funded and privately offered testing, mandating validation protocols, proper consent processes, and structured follow-up care. Oversight from an independent authority would help ensure adherence to ethical standards across sectors.[2,5]

Policies must also differentiate between clinical diagnostics and commercial data use, especially where free testing functions as a gateway for large-scale genomic data collection. Clear norms for disclosure, public reporting, and benefit-sharing should be mandated, ensuring that individuals understand how their data will be used and how they might benefit from participation.[5,6]

In parallel, there is a pressing need to invest in the training of healthcare providers, particularly physician associates. These professionals often serve as the first point of contact for patients undergoing genetic testing, and their ability to explain results, obtain informed consent, and coordinate care is critical. Training modules should include ethical counseling practices, data privacy awareness, and culturally sensitive communication techniques.[2,14]

By equipping physician associates with these competencies, India can enhance the ethical quality and reach of its genetic services. This approach would help mitigate systemic inequities, foster public trust, and ensure that genetic testing is implemented as a tool for inclusive and responsible healthcare.

Conclusion

Summary of Key Points

Free genetic testing in India presents a complex interplay of promise and peril. While such programs aim to promote early detection of inherited conditions and expand access to genomics, this review has highlighted considerable challenges in their clinical validity, ethical implementation and systemic integration. The absence of population-specific calibration in commercial tests, inadequate genetic counseling infrastructure, and fragmented care pathways pose risks to diagnostic accuracy and patient outcomes.[2–5] Ethically, concerns about informed consent, privacy, and exploitation—particularly among low-literacy and tribal populations—remain pressing.[6,8,14] Additionally, the economic burden of follow-up care and the potential social consequences, such as stigma or genetic discrimination, underscore broader societal implications.[2,13,14] Regulatory oversight continues to lag behind technological expansion, especially in managing data governance and ensuring ethical equity across testing platforms.[2,5,6]

Future Directions

To bridge these gaps, India must develop and enforce comprehensive, culturally sensitive policies tailored to its sociodemographic landscape. Integration of genetic testing into

the National Health Policy must prioritize quality control, privacy protection, and fair data use.[2,5] Importantly, physician associates have a pivotal role in navigating these complexities. Positioned at the frontlines of primary care, they can support patients by offering ethical counseling, ensuring informed consent, and guiding follow-up care.[2,14] Strengthening their training in genomics and ethics will be essential to promote equitable, responsible, and patient-centered implementation of genetic services across India.

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NARRATIVE REVIEW ARTICLE

Reimagining Maternal Health: The Crucial Role of Social and Behavior Change Communication in LMICs

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Abstract

Preventable maternal mortality is still remarkably high in low- and middle-income nations despite growing investments in maternal health systems. Conventional methods have focused mostly on expanding access to services, ignoring important social and behavioral factors that affect how people seek healthcare. To bridge the gap between the availability and actual consumption of maternal health treatments, this opinion highlights the critical role that social and behavior change communication plays. The article uses real-world examples from Bangladesh, Nepal, India, Ethiopia, Nigeria, Ghana, and Uganda to show how social and behavior change communication (SBCC) can empower women, change the dynamics of household decision-making, and create supportive environments for prompt maternal care when it is contextually appropriate, participatory, and sustained. SBCC should be viewed as a fundamental component of maternal health policies and initiatives rather than as an additional tool.

Keywords Social and behavior change communication (SBCC); maternal health; low- and middle-income countries (LMICs); community engagement; antenatal care; health communication; gender norms; behavior change; health systems; public health strategy

In light of the devastating deaths of five pregnant women in Ballari, Karnataka, in November 2024, a state-appointed technical committee led by the director of health and family welfare services released a report reviewing all maternal deaths recorded between April and December 2024.[1] These findings offer a harsh reality beyond mere statistics; they underscore a deeper crisis in how we understand and respond to maternal health risks.

Billions have indeed been invested in maternal health systems across low- and middle-income countries (LMICs), whereas the death toll portrays a sobering story. In 2023, approximately 260,000 women lost their lives due to pregnancy-related complications and 92% of these deaths occurred in LMICs,[2] that is, more than a quarter of a million women, most of them young, most of whose lives could have been saved. The services exist. The policies are in place. However, the women are not walking through the doors.

Why? Because our interpretation of the problem is fundamentally flawed. For decades, maternal health efforts have been confined to improving access in terms of building more clinics, training more workers, and supplying more drugs. However, what if the greatest hindrance is not accessibility? Could there be a real challenge stemming from belief systems, household power dynamics, social taboos, and misinformation, that is, where social and behavior change communication (SBCC) steps in and why it is time to move it from the margins and place it at the center of the discussion?

What Is SBCC (and What Is It Not)?

Social and behavior change communication transcends catchy slogans or posters on clinic walls. It is a science-backed, community-driven approach to changing the way people think, feel, and act. It encompasses a range of approaches, from radio dramas to home visits and mobile phones to local theatre, thereby reshaping norms and building demand for health services.

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Digital Messaging to Close the Knowledge Gap (Bangladesh—Aponjon)

Aponjon from Bangladesh stands out as a simple yet transformative mHealth initiative. Originally a donor-funded pilot launched in 2011 through USAID/J&J grants via the Mobile Alliance for Maternal Action (MAMA) in select districts, it was scaled nationally by 2012 through a US-Bangladesh Program Agreement with the Ministry of Health and Family Welfare (MoHFW), which assumed ownership through a multiagency advisory board. Access to Information Program II (A2I-II), which is based on the Prime Minister's Office, leads efforts to integrate digital service delivery across government bodies and serves as an official partner for Aponjon, enabling coordination among agencies. The concept was straightforward: mobile messages were sent to expectant mothers and their families with pregnancy advice, danger signs, and care reminders. What was the impact, one may ask? Increased antenatal check-ups, earlier care seeking and more confident, informed women. When information is timely, personal, and trusted, it can transform behavior. After donor funding concluded in 2018, the initiative transitioned to an independent model and was rebranded LifeChord by Dnet. The organization developed proprietary software to reduce dependence on third-party platforms and expanded sales channels to generate sustainable revenue. Aponjon demonstrated that even the most basic technology, when thoughtfully applied, can bridge the knowledge gap that holds so many women back.[3]

Beyond Information: Shifting Household Norms (Nepal—Suaahara/Bhanchhin Aama)

One must also understand that the true strength of SBCC lies not only in delivering information but also in shifting social norms. In many communities, the decision to seek care is not made by the woman herself. It is made by her husband, her mother-in-law, or her religious elder. In patriarchal households, silence is the default. The Suaahara program in Nepal identified it accurately. Launched in 2011 as a USAID-funded pilot in 10 districts, Suaahara was intentionally designed for scale rather than as a standalone intervention.[4] By 2016, its core components, most prominently the *Bhanchhin Aama* radio drama and facilitated community discussion groups, had been embedded within Nepal's public health system through the Ministry of Health and Population and the Family Welfare Division. The program deliberately shifted maternal nutrition from being viewed as a woman's responsibility to a shared family concern by engaging men and older women and by using culturally grounded tools such as songs, storytelling, and community theater. This approach opened space for women's voices and collective decision-making at the household level.

In collaboration with the Government of Nepal, *Bhanchhin Aama* became the backbone of a wider mass and community media strategy. Local implementation remained adaptive, integrating folk media, "laddoo dramas" promoting iron–folic acid consumption and dialogue with mothers-in-law and men into Female Community Health Volunteer (FCHV) platforms while remaining aligned with national guidelines. The radio drama continued to air on Radio Nepal for more than a decade, producing over 300 episodes and reaching an estimated 80% of rural households. By 2020, approximately 70% of community groups remained active with government support, and 60–70% of key activities were sustained through routine nutrition campaigns. The capacity-building of over 18,000 Female Community Health Volunteers (FCHVs) and rapid digital adaptations during the COVID-19 pandemic further anchored the program within existing systems.

The results of *Bhanchhin Aama* were notable: exclusive breastfeeding increased from 52% at baseline to 82% by 2016 and remained high at 78% in 2020. Timely complementary feeding rose from 33% to 55%, maternal dietary diversity improved by nearly 20 percentage points, and antenatal care attendance (four or more visits) increased markedly, reflecting shifts in household norms and shared responsibility. Child stunting declined from 42% to 33% in the intervention areas, which continued to outperform that in the comparison districts.[5]

Together, the Aponjon program in Bangladesh and the Suaahara program in Nepal are important lessons for LMICs. Mobile phone messages can help people learn more about health and keep their appointments, especially when the information is reliable and relevant to them. However, real and lasting changes occur when SBCC becomes part of the regular health system. This means using existing government programs, involving frontline health workers, and supporting messages with community discussions that influence family habits. Understanding this distinction is key for countries that want to move SBCC from short-term projects to permanent health services.

India: Moving from Coverage Metrics to Behavioral Outcomes

In India, SBCC is formally integrated into several health programs. Within India's National Health Mission (NHM) and Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A platforms), SBCC is operationalized primarily through frontline and community-based delivery—Accredited Social Health Activist (ASHAs), Auxiliary Nurse Midwives (ANMs), and Anganwadi Workers—supported by interpersonal counseling tools and periodic campaign messaging. However, SBCC intensity and quality can vary by state and district, and monitoring often prioritizes service coverage (e.g., antenatal visits and institutional delivery) over

behavioral indicators (e.g., diet diversity, timely danger-sign recognition, and birth preparedness). Therefore, strengthening SBCC in India does not require "starting new programs" but rather systematizing and resourcing what already exists—standardizing toolkits, strengthening counseling skills, ensuring supportive supervision, and tracking behavioral outcomes alongside coverage. While schemes such as Janani Suraksha Yojana (JSY) focus primarily on financial incentives for institutional deliveries, SBCC is embedded through frontline workers such as ASHAs, ANMs, and Anganwadi workers, who counsel pregnant women and their families using visual aids, storytelling, and home visits to influence care-seeking behavior. JSY did normalize hospital births. The money mattered, but the conviction to have a safe and supervised institutional birth mattered more.[6]

The evidence also suggests that SBCC can amplify structural investments rather than compete with them. For instance, financial incentives and facility upgrades can increase availability and affordability, but SBCC addresses whether families recognize risk, trust the system, and prioritize timely care seeking—especially when decisions are shaped by household power dynamics. Comparative analyses from maternal nutrition programs in India have similarly shown that behavior change interventions can improve dietary diversity and reduce socioeconomic inequality beyond what service expansion alone achieves. Taken together, these data support the view that SBCC is not an "add-on" but rather a mechanism that helps populations convert access into utilization.

Behavior Changes Through Multimedia Strategies (Nigeria—NURHI)

Similarly, Nigeria's Urban Reproductive Health Initiative (NURHI) demonstrates the effectiveness of multimedia strategies in reshaping norms around family planning and maternal care. Launched in 2009 by the Bill & Melinda Gates Foundation in partnership with organizations such as ACORN/CMC, NURHI started as an urban pilot in four cities: Abuja, Benin, Ibadan, and Ilorin, using radio dramas (most notably Taba Male), mobile outreach, community events, and service vouchers to dispel misconceptions and increase service uptake. The program gradually transitioned from pilot implementation to system integration: Phase I (2010–2014) focused on improving service quality and demand generation, whereas Phase II (2015–2019) extended to more cities and integrated important strategies into state health systems, supporting Nigeria's National Family Planning Blueprint (2014–2018).[7] NURHI emphasized sustainability through "pathfinder" models that trained over 5,000 health providers and transferred communication and demand-generation tools to government institutions. Post-project assessments revealed that 60–70% of improvements in service delivery and demand were sustained in the original cities, with radio programming continuing at commercial stations. Rigorous evaluations further demonstrated substantial impacts, including a rise in the prevalence of modern contraceptive use among urban women from 16% to 35% between 2010 and 2019, alongside declines in unmet family planning needs, increased facility deliveries, and significant gains in spousal approval for family planning.[8]

Community Dialogue for Danger-Sign Recognition (Ethiopia)

In Ethiopia, a 2024 community-based intervention in the Jimma Zone (Oromia region) demonstrated the effectiveness of locally tailored SBCC strategies, particularly community dialogues and mother and mother-in-law group discussions, in improving awareness of obstetric danger signs and influencing timely care seeking. As a cluster-randomized controlled trial across three districts (Manna, Shebe-Sombo, and Degema), the pilot worked through 16 primary healthcare units and leveraged Ethiopia's health extension workers, aligning closely with the national health extension program. The intervention was time bound (May–December 2023) and primarily research funded, which limited its sustainability. Some activities were absorbed into existing community structures, including women's development army groups, but long-term continuation will depend on dedicated government financing. Despite these constraints, the impact was notable: knowledge of obstetric danger signs increased substantially, institutional delivery rates rose significantly, and antenatal care uptake and maternal health attitudes improved by 20–30% in intervention clusters.[9]

Embedding SBCC in Community Systems (Mozambique—CLIP)

Mozambique's Community-Level Interventions for Pre-eclampsia (CLIP) project illustrates the effectiveness of embedding SBCC within community health systems to enhance maternal health outcomes. The initiative brought together community leaders and frontline health workers in structured discussions on early warning signs of preeclampsia, promoting shared understanding and encouraging prompt care seeking among pregnant women. Regular community meetings and participatory platforms helped institutionalize referral practices and strengthened connections between households and formal health services.

CLIP was implemented as a cluster-randomized research project in Maputo and Gaza Provinces between 2014 and 2018, with funding from the Bill & Melinda Gates Foundation. It was closely associated with Mozambique's primary health-care framework. The intervention operated through existing community health workers, combining community dialogues, leadership engagement, mobile decision-support tools, and locally designed emergency transport mechanisms. Covering more than 15,000 pregnancies, CLIP strengthened early risk identification, triage, and referral timeliness, with particularly favorable outcomes among women receiving more intensive engagement (eight or more contacts), underscoring the value of sustained, community-based SBCC within comprehensive maternal health systems.[10]

Community-Embedded SBCC Improving Maternal Outcomes (Ghana—EPPICS)

In Ghana's East Mamprusi District, the CRS-led EPPICS project (2012–2015) implemented a culturally adapted SBCC package that improved maternal knowledge and health-seeking behaviors. Using model mothers, community surveillance, and trusted local channels, the initiative enhanced awareness of obstetric danger signs, antenatal care, and skilled birth attendance, successfully shifting household norms in northern Ghana.

Integrated within Ghana health service structures, the district pilot trained community leaders, community health workers (CHWs), and facility staff and employed tools such as scoreboards and pregnancy audits to promote ANC and institutional deliveries. Despite being time bound, some gains persisted after the project through mentoring and model mothers, with institutional deliveries remaining above 70%. Skilled deliveries rose from 43% to 76%, institutional maternal mortality fell from 295 to 81 per 100,000 live births, and postpartum danger-sign knowledge increased from 40% to 77% (odds ratio 2.7), demonstrating the impact of locally tailored, trusted SBCC strategies.[11]

Why Is SBCC Still Undervalued?

Despite its proven impact, the concept of SBCC remains underfunded, underutilized, and undervalued. It is still treated as a checkbox item in several health programs, a one-off campaign at the start of a five-year project. Without sustained investment, cultural tailoring, and mechanisms for feedback and adaptation, even well-designed messages can fall flat. Worse still, an overreliance on mass media without complementary interpersonal or community-based engagement can reduce SBCC to background noise.

Interpersonal Communication: The Core Driver of Change (Bangladesh-Manoshi Project)

The impact of SBCC is greatest when communication is personal, as shown by BRAC's Manoshi project in Bangladesh's urban slums. Launched in 2007, the program scaled Shasthya Shebika (CHWs) across 29 cities, tracking pregnancies, facilitating referrals, and promoting behavior change. The program increased skilled birth attendance from 14% to 84% and prevented over 1,000 maternal deaths by 2017. The Manoshi aligned with Bangladesh's community clinic network, providing seven or more antenatal contacts, escorting women to facilities, and shifting household norms—informing national MNCH strategies. Initially donor supported, the program transitioned to BRAC's core operations after 2016, sustaining more than 6,000 CHWs and delivery centers. Home births decreased from 86% to 16%, postnatal visits reached 99%, and maternal mortality declined from 294 to 130 per 100,000, outpacing national trends.[12] The program highlights interpersonal communication as a core driver of change, with community workers using repeated home visits and tailored counseling to shift household decisions around maternal care.

Gender-Transformative SBCC (Rwanda—MenCare)

To question conventional gender roles and encourage men's active participation in prenatal check-ups and birth preparation, Rwanda's Bandebereho ("fathers who take care") initiative under the MenCare campaign, funded by MenCare+ (EU, USAID, Gates Foundation), engaged men through gender-transformative SBCC. Implemented as a multisite pilot (2012–2015) across four districts with 1,199 couples, the program complemented national maternal health goals and promoted shared household responsibility. Although the pilot concluded, key elements have been integrated into Rwanda's health system through CHWs, with curricula adapted for routine delivery and phased district expansion underway. At 21-month follow-up, the intervention couples demonstrated significantly better outcomes than did those in the control group, with increased ANC attendance, higher contraceptive use (70% vs. 61%), and men spending 52 extra minutes daily on household chores. The prevalence of physical intimate partner violence was lower in the intervention arm (33%) than in the control arm (57%). Reports of sexual violence followed a similar pattern, with 35% in the intervention group and 60% in the control group, demonstrating the impact of culturally grounded, gender-transformative SBCC on maternal and family health.[13]

Measuring Impact

Naturally, these concepts raise questions about impact measurement. Donors and governments often ask, "What's the ROI on communication?" However, how do you quantify a shift in mindset? How do you measure the moment a father agrees to let his wife seek care or when a young girl finds the courage to speak up in a community meeting? The impact of SBCC may defy neat metrics, but it is profound, measured in terms of not only numbers but also autonomy, dignity, and the growing confidence of women in making decisions about their health.

What Must Change: Policy and Implementation Priorities

First, LMICs must institutionalize SBCC by embedding it in all national strategies, allocating dedicated budgets, and integrating it into all maternal health policies, not as a communication plan but as a behavior change strategy. Ethiopia's Health Extension Program has shown what is possible when SBCC is embedded in frontline care. It has improved hygiene, nutrition, and maternal outcomes, all of which are driven by peer-led, locally relevant messages.[14]

Second, sustained investments in capacity building are essential. Frontline workers must be equipped not only with technical knowledge but also with core communication competencies, including listening, negotiation, persuasion, and motivation. SBCC programs therefore require targeted investments across multiple domains to build capacity, sustain behaviors, and achieve public health outcomes. These include training investments such as skill-building workshops, training-of-trainers models, and cascading programs. These approaches strengthen competencies in audience analysis, message design, material development, and monitoring and evaluation, supported by posttraining mentorship to ensure application in real-world settings. However, capacity building alone is insufficient without adequate financing for salaries, incentives, and supportive working conditions for frontline workers, supervisors, and community agents engaged in interpersonal communication and outreach.

Investments are also required for sustained community engagement through peer-led outreach, home visits, group dialogues, and community events that address local barriers and reinforce collective norms. To achieve scale and normative reinforcement, SBCC further depends on investments in mass media and mid-media for the production and dissemination of culturally appropriate messages, complemented by digital communication platforms that support personalized messaging, job aids, peer learning, and real-time reinforcement. Resources for supportive supervision, including routine coaching, mentoring, and performance feedback, are critical to maintain quality, motivation, and adaptive learning beyond initial training.

Third, SBCC must be community driven. It should never be a top-down broadcast. It should be co-created with the population it aims to serve. When messages reflect local stories, languages, and beliefs, they resonate. Participatory approaches such as community videos in Uganda[15] or street theatre in India bring authenticity and credibility that superficial media often fail to deliver.

Finally, we must embrace digital tools with inclusion in mind. WhatsApp groups, voice bots, and interactive SMS platforms can revolutionize outreach. However, if these tools exclude women without smartphones or digital literacy, they risk reinforcing inequity and adding to the existing digital divide. SBCC in the digital age must be both innovative and equitable.

The Economics: What We Know About Cost-Effectiveness

Emerging evidence suggests that SBCC investments can be cost-effective relative to many traditional health-system expenditures, although the economic evidence base remains limited and heterogeneous. Modelling work on family planning SBCC in Zambia and Guinea estimated that scaling up SBCC programming would cost approximately US$1,051 per DALY averted in Zambia and US$438 per DALY averted in Guinea, figures that fall below common cost-effectiveness thresholds. The same models estimated that every US$1 invested in SBCC yielded an estimated US$2.30–$6.10 in savings when accounting for averted healthcare costs and productivity losses.[16] An economic evaluation of a health behavior change intervention layered onto women's self-help groups reported a cost per life-year savings of approximately US$3,825, by reaching over 17,000 women and preventing an estimated 23 neonatal deaths.[17] Research on the unit costs of SBCC interventions across low- and middle-income settings has shown wide variability by intervention type; media approaches often cost less per person reached than interpersonal communication does, highlighting how intensity and delivery modality influence overall costs. While SBCC often accounts for a relatively small share of overall health spending in low- and middle-income settings, empirical studies indicate that well-designed SBCC interventions can substantially influence health behaviors and related outcomes. They also offer sustained impact, unlike one-time clinical expenditures that yield diminishing returns after rollout. These examples point to potential economic value for SBCC relative to conventional health inputs but also reveal important gaps: inconsistent costing methods, limited long-term

ROI data, and few standardized outcome measures. This evidence gap highlights the need for future research with standardized cost-effectiveness and ROI methodologies to better inform investment decisions and fully characterize how SBCC complements traditional health system spending.

Implications for LMICs: Institutionalizing SBCC as a Core Program Function

The evidence presented in this article demonstrates that social and behavior change communication is not merely an enabling activity but also a decisive factor shaping maternal health outcomes. Across diverse settings, programs that integrated SBCC consistently achieved greater service utilization, improved maternal nutrition and care-seeking behaviors, and narrower socioeconomic disparities than comparable programs relying on structural inputs alone. These findings show that investments in facilities, cash incentives, and workforce expansion yield substantially different results depending on whether women are informed, motivated, and supported to act on available services.

SBCC should be institutionalized as a core programmatic function within India's maternal health initiatives rather than treated as a peripheral activity. This entails earmarking dedicated SBCC budgets within national and state program implementation plans under the National Health Mission, with clear guidance on minimum SBCC intensity per beneficiary. India's frontline workforce—particularly ASHAs, ANMs, and Anganwadi workers—should be further empowered as the backbone of SBCC delivery through structured training in counseling, negotiation, and community engagement, supported by standardized, evidence-based SBCC toolkits aligned with maternal health and nutrition priorities. Monitoring and accountability mechanisms should evolve beyond service coverage metrics to include behavioral and equity-sensitive indicators, such as dietary diversity, timely antenatal care, and adherence to recommended practices, disaggregated by socioeconomic status.

Embedding SBCC within India's existing maternal health platforms offers a high-return opportunity to maximize the impact of substantial public investments in facilities, incentives, and human resources. Without sustained and systematic SBCC, these investments risk reinforcing existing inequalities in service uptake. By contrast, positioning SBCC as an essential driver of demand, trust, and behavior change can enable India's maternal health programs to deliver not only broader coverage but also more equitable and durable health gains.

The experiences reviewed in this article point toward several practical directions for strengthening maternal health programs. A key lesson is the value of embedding SBCC as an integral component of national and state strategies. This requires dedicated resources and systematic planning rather than treating it as an occasional campaign. Equally important is investing in the people who deliver care at the community level—equipping frontline workers with effective counseling skills, ongoing mentorship, and practical communication tools tailored to maternal risk, nutrition, and birth preparedness. The examples also suggest that broad media messaging works best when complemented by community-based approaches that actively involve husbands, mothers-in-law, and other local decision-makers. Finally, meaningful progress requires looking beyond simple counts of activities or messages delivered and tracking behavioral and equity-focused outcomes, such as timely care seeking, improved knowledge of danger signs, and reductions in socio-economic gaps.

Conclusion: Autonomy, Trust, and the Unfinished Agenda

To highlight the truth, maternal health is not just about access to services. It is about access to autonomy. It is about providing women with the knowledge, confidence, and support to make decisions about their health. SBCC is one of the few tools that can do that, not just by building facilities but also by building trust.

No woman in any corner of the world should die because she did not know, was not told, or was not allowed. If we are truly committed to ending preventable maternal deaths, it is time we start funding conversations and not just construction at the community level.

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CASE REPORT

Endo-epicardial Ventricular Tachycardia Ablation in Arrhythmogenic Right Ventricular Cardiomyopathy

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Abstract

Background: Arrhythmogenic right ventricular cardiomyopathy (ARVC) is a rare inherited disorder characterized by progressive fibrofatty replacement of the right ventricle, predisposing patients to ventricular arrhythmias and sudden cardiac death. As the arrhythmogenic substrate frequently involves both endocardial and epicardial layers, conventional ablation strategies may be insufficient.

Results: Two patients with ARVC and recurrent ventricular tachycardia underwent combined endo-epicardial ablation. Both patients achieved successful arrhythmia control, with non-inducibility of ventricular tachycardia post-procedure. At follow-up, both remained asymptomatic without recurrence and experienced no further implantable cardioverter-defibrillator therapies.

Conclusion: Combined endo-epicardial ablation appears to be an effective strategy for achieving durable ventricular tachycardia control and reducing device-related therapies in patients with ARVC.

Keywords ventricular tachycardia, rare genetic disorder, RV cardiomyopathy, combined endocardial and epicardial ablation

Introduction

Arrhythmogenic right ventricular cardiomyopathy (ARVC) is a rare genetic disorder marked by progressive fibrofatty replacement of the right ventricle (RV).[1] Its progression typically starts from the epicardium toward the endocardium. This condition occasionally involves both ventricles and causes left ventricular (LV) dysfunction. This condition is more commonly seen in young adult males in the age group of 21 to 40 years.[2] The manifestations of ARVC are syncope, presyncope, life-threatening ventricular arrhythmias, or even sudden cardiac death (SCD). Diagnosing ARVC is based on the criteria called task force criteria,[3] which involve ECG findings, 2D echocardiography, cardiac MRI, documented arrhythmias, and family history. It is most commonly inherited in an autosomal dominant manner. Genetic testing is an important diagnostic modality to identify genetic variants and carriers in family members. Eight known genes have been demonstrated for ARVC (PKP2, DSP, DSG2, DSC2, JUP, TMEM43, DES, and PLN). The prognosis of ARVC is predicted by the percentage and severity of ventricular arrhythmias, ventricular dysfunction, and cardiac arrest. Antiarrhythmic medical therapy is one option that can be used to reduce sudden ventricular arrhythmia events. A patient presenting with recurrent VT should not have an ICD placed without treating the VT. This is because the patient will end up with several ICD shocks, which are painful for the patient and deplete the battery. Hence, our patient underwent VT ablation followed by ICD implantation. In addition, lifestyle modification, such as restricted vigorous sports and exercise, may also help to reduce exercise-triggered ventricular arrhythmias and SCD.

One of the effective therapeutic therapies is called combined endo-epicardial RF ablation for patients with ARVC and ventricular arrhythmias or recurrent shock from an automated implantable cardioverter defibrillator (AICD) device in ARVC.[4] It leads to good arrhythmia control and a significant

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reduction in AICD shock. Here, we discuss two cases of successful endo-epicardial ablation for patients with ARVC diagnosed as per the Revised Task Force Criteria 2023[5] who presented with VT and recurrent AICD shocks despite optimal medical therapy. These two patients benefited from endo-epicardial ablation and did well without VT and AICD shocks.

Case Description

Case 1

A 42-year-old male presented with a history of VT and post-cardiac arrest status with a past history of cardioembolic stroke (recovered right-sided hemiparesis). He had a family history of SCD. His baseline ECG showed low-voltage complexes and epsilon waves in V1 (Fig. 1A) and V2. Documented VT ECG showed left bundle branch block morphology with prolonged intrinsicoid deflection and a pseudodelta pattern (Fig. 1B). A 2D echocardiogram showed moderate LV dysfunction. Cardiac MRI showed biventricular involvement with severe RV dysfunction, moderate LV dysfunction, and transmural delayed gadolinium enhancement in the anterior wall of the RV. All these findings pointed to a working diagnosis of ARVC. Hence, a genetic test was performed, which showed positive DSP (desmoplakin heterozygous) and DOLK (Dolichol kinase homozygous) gene mutations. He was taken up for the cardiac EP study and endo-epicardial radiofrequency ablation (RFA) under a 3D system (Ensite) under general anaesthesia. Upfront epicardial and endocardial access was taken for mapping. Sosa's technique[6] was used to obtain epicardial access by puncturing the

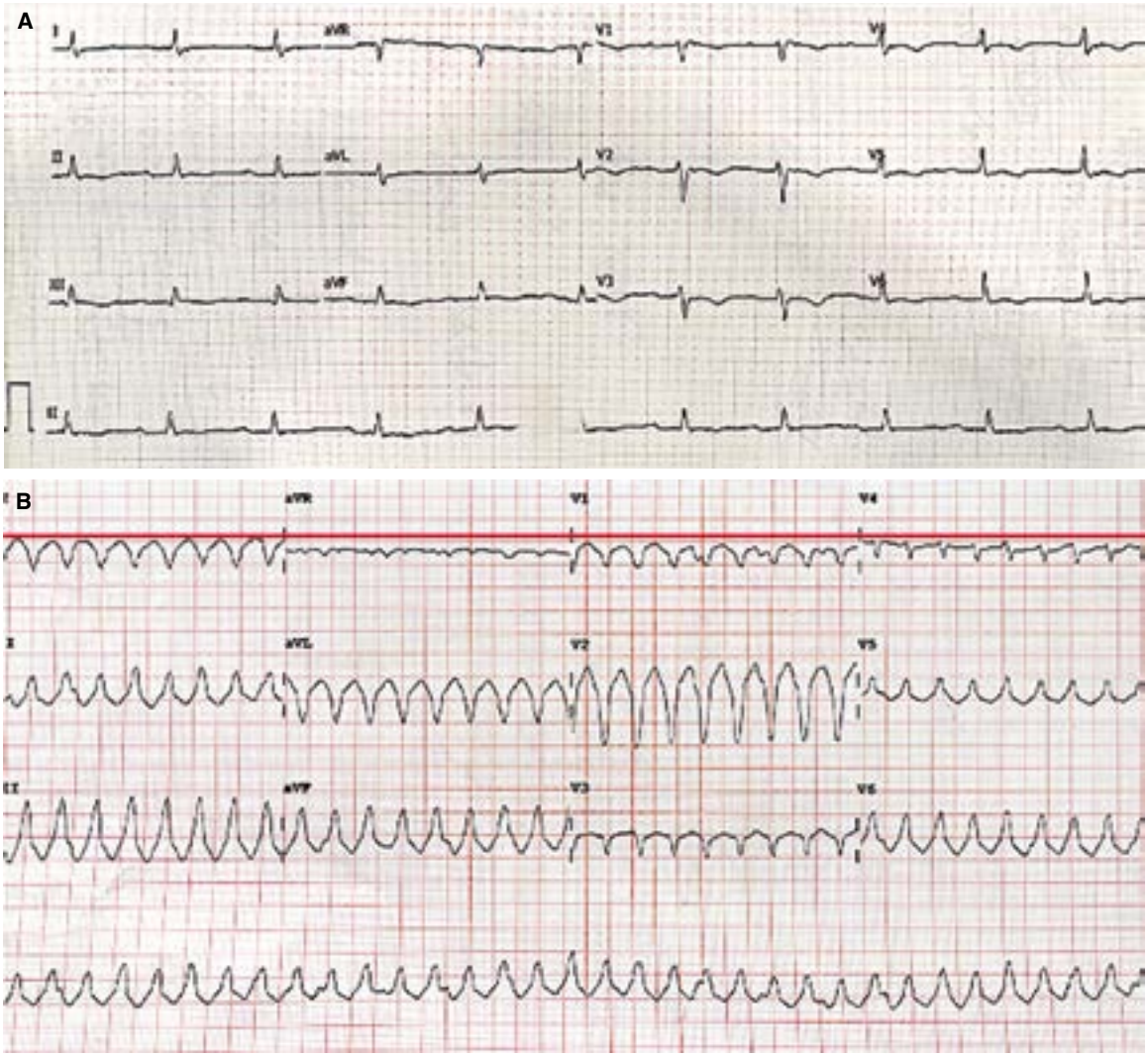

Figure 1 Patient with (A) baseline low voltage complexes and epsilon wave in V1 and V2; (B) VT LBBB morphology, with prolonged intrinsicoid deflection and pseudodelta pattern. VT, ventricular tachycardia; LBBB, left bundle branch block

pericardium using a large bore needle (18G Touhy needle) to gain access to the pericardial space. In the RAO and LAO fluoroscopic views, the operator advances the needle into the pericardial space toward the left sternal border. Contrast is injected to visualize entry into the pericardial space. After successful entry, a long 0.035″ wire is placed followed by a sheath. Voltage and activation mapping was performed during sinus rhythm as well as during VT through the endocardium and epicardium using an HD grid mapping catheter. Voltage cutoffs used in mapping were 0.5–1.5 mV bipolar for LV endocardial scars and unipolar <8.3 mV for LV epicardial scars, as per consensus guidelines.[7] Catheter contact was confirmed by noting ST elevation in unipolar signals during voltage mapping and unipolar QS patterns during activation mapping. Endocardial voltage mapping showed extensive unipolar and bipolar low voltage zones in the RV anterior free wall (Fig. 2B). During epicardial mapping, an extensive bipolar low-voltage zone and scar were noted (Fig. 2A). Isochronal late activation mapping (ILAM) was performed during VT to locate the entry site of the isthmus and tagged during entrainment (Fig. 2C). RFA was performed epicardially and endocardially at 30–35 W, 43 C with a targeted impedance drop of 10%. A total of 56 lesions administered during VT resulted in termination of tachycardia (Fig. 3). Local substrate modification was performed. Post-RFA, VT could not be induced with an aggressive induction protocol, even with IV isoprenaline. The epicardial sheath was kept in situ for 1 day and was removed. The patient was implanted with an AICD for secondary prophylaxis before discharge.

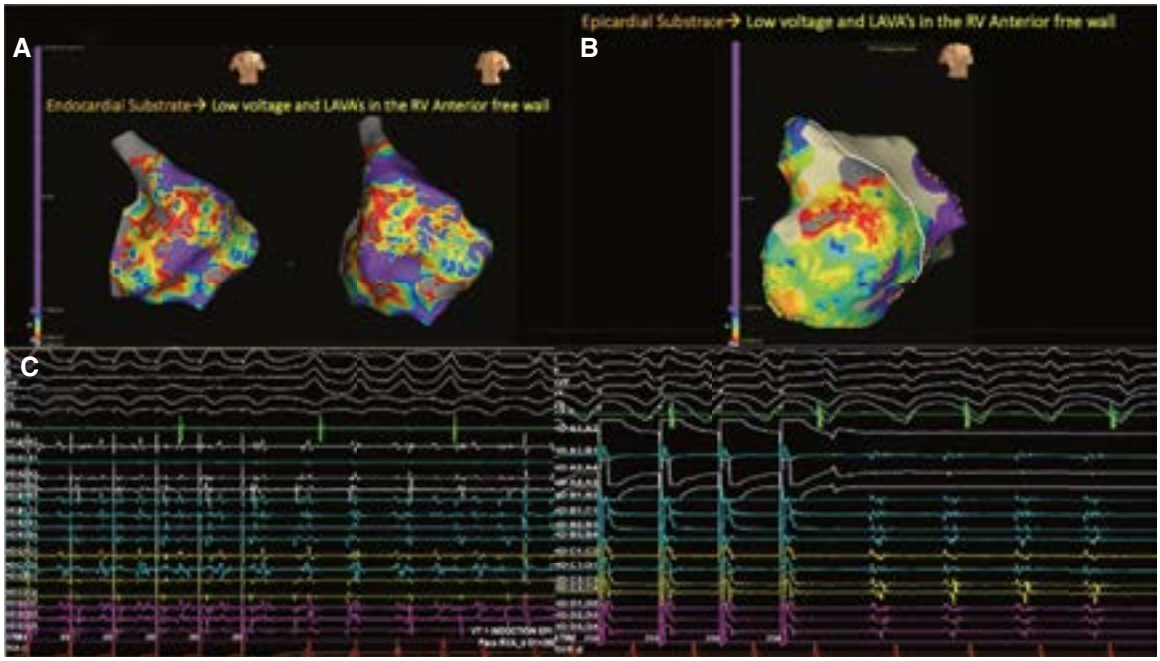

Figure 2 Patient 1: (A) epicardial voltage map, (B) endocardial voltage map, (C) during entrainment, the entry site of the isthmus was noted

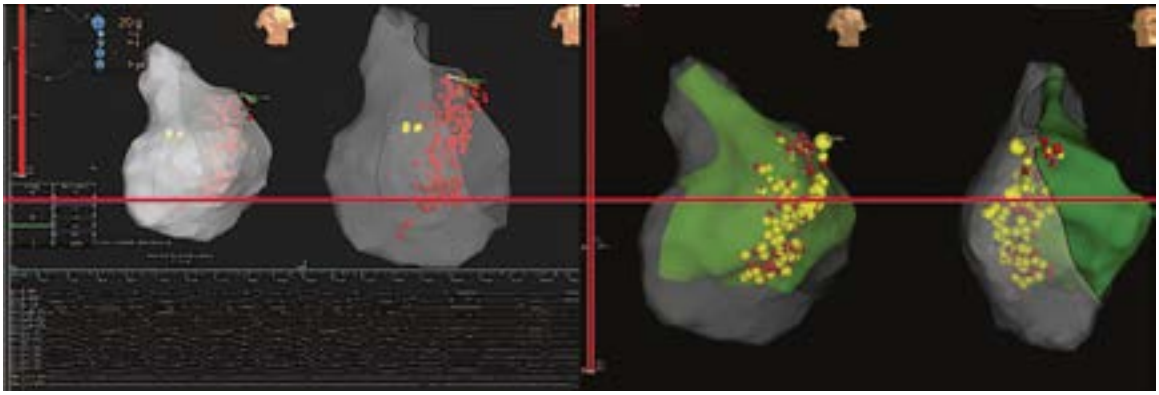

Figure 3 Patient 1: Epicardial and endocardial radiofrequency ablation resulted in the termination of VT. VT, ventricular tachycardia

Case 2

A 44-year-old male diagnosed with ARVC was implanted with a single-chamber AICD elsewhere. He presented with recurrent VT storms and recurrent shocks from the AICD (Fig. 4). Other comorbidities included type 2 diabetes mellitus and hypertension. Two-dimensional echocardiography showed severe RV dysfunction and normal LV function. No family history of SCD was reported. Genetic testing was positive for a Plakophilin gene (PKP2) mutation (heterozygous). The patient was taken up for a cardiac EP study with upfront endo-epicardial VT ablation under general anaesthesia. Combined endocardial and epicardial mapping was performed with an HD grid catheter and a decapolar catheter. Pacemapping showed isolated firing and late fractionated potentials in the RV anterior free wall. A voltage map was taken through the epicardium (Fig. 5A) as well as from the endocardium during sinus rhythm using the same voltage criteria as per the previous case (Fig. 5B). Low voltage areas were noted in the epicardium, which corresponded to the endocardial substrate. During ILAM, late potentials were noted in the right ventricular outflow tract (RVOT) anterior wall. In this case, VT could not be induced with programmed stimulation. A substrate-based mapping strategy, called decremental-evoked potential mapping (DeEP), was used to find isolated near-field potentials. This mapping technique is used by delivering decremental extra stimulus and observing late potentials around the area of interest. In this case, there was a local activation delay of 20 ms at the RV anterior wall during the decremental extra stimulus, suggesting the critical site of the isthmus.[8] Endo-epicardial substrate modification was performed at the RVOT anterior wall site (Fig. 5C). Post-RFA, VT could not be induced. The epicardial sheath was kept in situ for 1 day and removed the next day. Both patients were followed up in clinic visits 1, 3, 6, and 12 months after the procedure, during which clinical evaluation, ECG, and AICD device interrogations were performed. Both benefited from endo-epicardial RF ablation with no VT recurrence and no high ventricular rate or therapy from the device.

Discussion

ARVC causes fibro-fatty infiltration in the RV involving the epicardium as well as the endocardium and leads to regional dysfunction, VT, and SCD. Combined endo-epicardial ablation is a highly effective method for achieving VT control and reducing AICD therapy. Our workflow for ARVC ablation involves taking upfront epicardial access under general anesthesia, followed by substrate mapping, identifying local abnormal ventricular activity (LAVA), ILAM mapping to locate late fractionated potentials, and voltage mapping to map low voltage areas.[9] If clinical VT is inducible, activation mapping is performed to determine the critical isthmus of tachycardia, and RF ablation is performed both through the endocardium and epicardium using 30–40 W power with an irrigated catheter. If VT was not inducible, DeEP was used to locate the critical isthmus site. In case 1, VT was inducible; hence, ILAM mapping was sufficient and complemented the VT map. In the second case, as the VT was not inducible, both ILAM and DEEP mapping were used to understand the putative isthmus sites, followed by epiendocardial substrate modification. Procedural safety for epicardial ablation was ensured by strictly adhering to Sossa's protocol for epicardial access, with echocardiographic monitoring for an increase in effusion, phrenic nerve stimulation during ablation, and

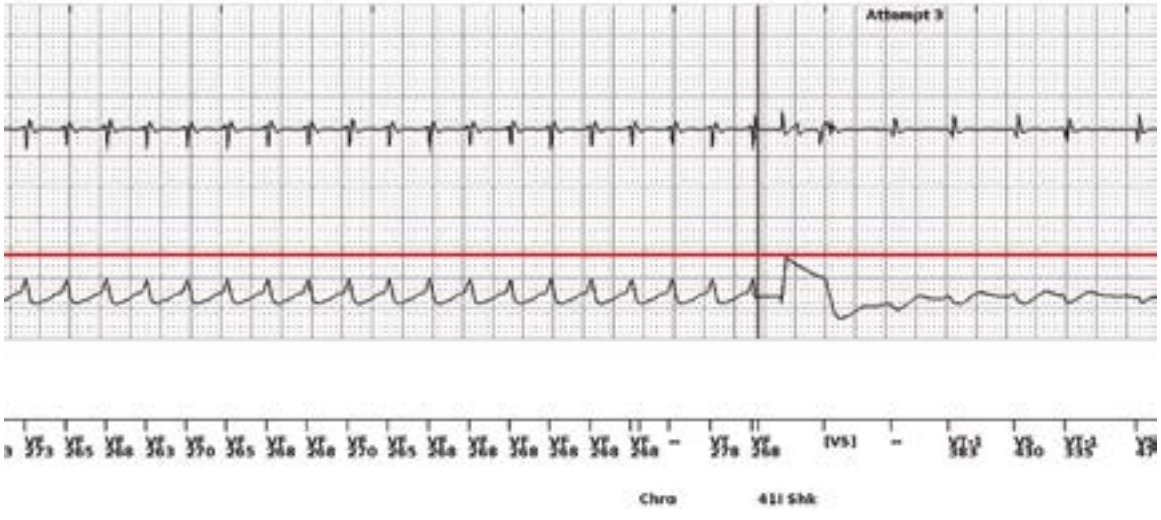

Figure 4 Patient 2: VT terminated with AICD shock. VT, ventricular tachycardia; AICD, automatic implantable cardioverter defibrillator

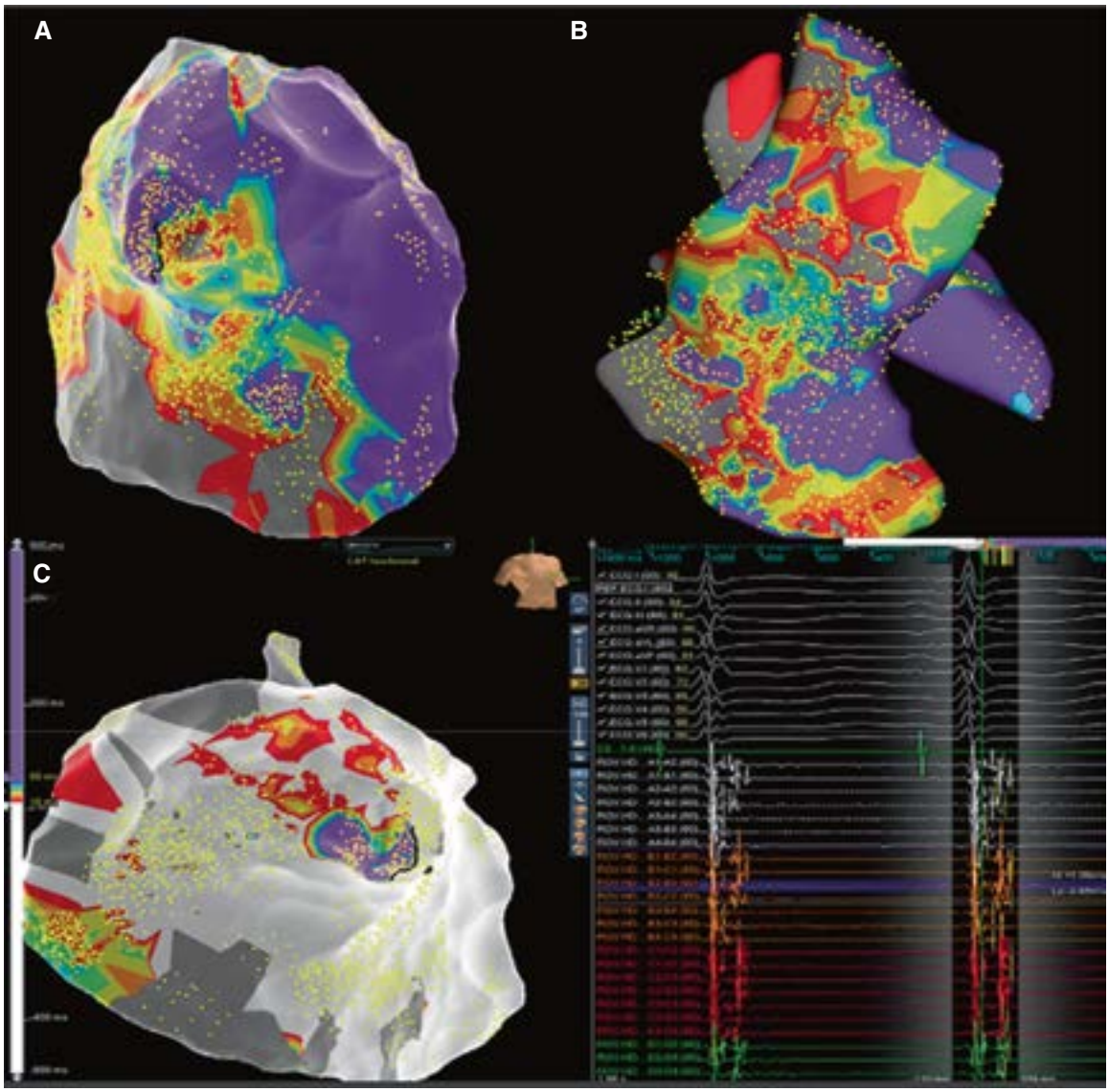

Figure 5 Patient 2: (A) low voltage mapping done through epicardium; (B) voltage map through endocardium; (C) successful endo-epicardial substrate modification

coronary angiography ensuring that the catheter tip stayed > 4 mm from the coronaries. Postablation, patients received intrapericardial hydrocortisone and one week of oral colchicine. After the procedure, the patients were kept on antiarrhythmic therapy and close follow-up.

Conclusion

In patients with ARVC, a detailed diagnostic evaluation including imaging and genotyping, followed by optimal management, is essential. Our two case studies fill the knowledge gap in the management of such patients, who are at high risk for developing refractory VT. In addition to medical therapy and AICD implantation, endo-epicardial catheter ablation and substrate modification are effective methods in management, leading to a reduction in arrhythmia burden, AICD shocks, and SCD and play an important role in improving the patient's quality of life. Further long-term studies with larger cohorts of patients are needed to substantiate our findings.

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CASE REPORT

Stereotactic Radiosurgery for Unruptured Arteriovenous Malformation of the Left Medial Temporal Lobe in A Young Female

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Abstract

Background: Arteriovenous malformations (AVMs) are congenital vascular anomalies that can present with seizures or hemorrhage. Management strategies vary based on Spetzler-Martin grading.

Case Presentation: We report the case of a 22-year-old female presenting with recurrent seizures due to an unruptured AVM (SM Grade 3) present in the left medial temporal lobe. Diagnosis was established using MRI and digital subtraction angiography (DSA).

Intervention: The patient underwent single-fraction stereotactic radiosurgery (SRS) with curative intent using a TrueBeam linear accelerator.

Outcome: The posttreatment course was uneventful, and the patient was discharged with cessation of seizures and progressive nidus reduction documented on serial imaging over 12 months.

Conclusion: SRS is a feasible and potentially curative option for managing select unruptured AVMs in eloquent brain regions.

Introduction

Arteriovenous malformations (AVMs) represent a complex tangle of abnormal arteries and veins, bypassing the capillary system. The clinical presentation varies based on location and rupture status, with seizures being a common manifestation in unruptured AVMs. Treatment modalities include microsurgical resection, endovascular embolization, and radiosurgery. Here, we present a young female with an unruptured SM Grade 3 AVM in the medial temporal lobe that was managed successfully with stereotactic radiosurgery (SRS).

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Case Presentation

Patient Information

A 22-year-old female with a three-year history of four generalized tonic-clonic seizures.

Clinical Findings

The most recent episode occurred in February 2024, involving uprolling of eyeballs, tonic-clonic activity of limbs for approximately 3 minutes, tongue bite, and postictal loss of consciousness for 15–20 minutes.

Diagnostic Assessment

Initial Brain MRI (February 3, 2024): Revealed multiple flow voids measuring approximately 28 × 21 × 16 mm (AP × TR × CC) adjacent to the temporal horn of the left lateral ventricle, suggestive of an AVM. The rest of the cerebral gray and white matter showed normal signal and morphology (Fig.1).

EEG (February 2, 2024): Background consisted of 8–11 Hz alpha activity, symmetrical and synchronous, with

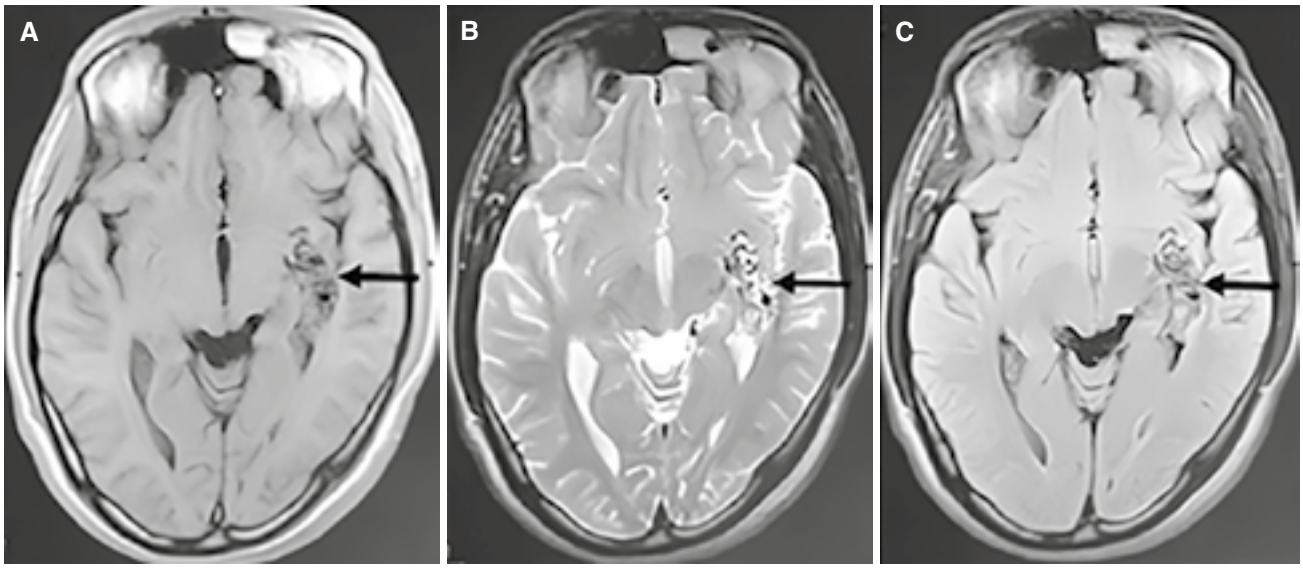

Figure 1 Brain MRI (T2-weighted axial section). (A) Axial noncontrast T1-weighted MR image, (B) T2-weighted MR image, and (C) FLAIR image at the level of the temporal horns, showing a cluster of serpiginous flow voids (arrows) in the left medial temporal lobe adjacent to the temporal horn of the lateral ventricle. These findings are consistent with an arteriovenous malformation (AVM) nidus, demonstrating typical signal characteristics on multimodal MRI

no definite focal or generalized epileptiform discharges noted. Activation procedures including hyperventilation and photic stimulation were unremarkable. Impression: No evidence of epileptic discharges in the record.

DSA with 3D Spin (March 13, 2024): Confirmation of a compact unruptured AVM in the left medial temporal lobe and juxtaventricular region, arising predominantly from the left posterior cerebral artery. The nidus measured 32 mm AP, 25 mm CC, and 27 mm T (3.2 × 2.5 × 2.7 cm). There was a draining vein with ectasia but no evidence of intranidal aneurysms or draining vein stenosis. Drainage occurred via the internal cerebral vein into the deep venous system. Classification: Spetzler-Martin Grade 3 (Fig. 2).

Multidisciplinary Team Decision

Following consensus among neurology, neurosurgery, and radiation oncology teams at PSG IMSR & Hospitals, Coimbatore, SRS was chosen as the definitive treatment modality.

Therapeutic Intervention

1. **Simulation Date:** March 25, 2024
2. **Treatment Date:** March 29, 2024
3. **Radiation Dose:** 18 Gy delivered in a single fraction
4. **Technique:** SRS with four arcs using a TrueBeam linear accelerator system
5. **Target Volume:** AVM nidus in the left medial temporal lobe
6. **Treatment Planning:** Conformal dose distribution with steep dose gradient to minimize exposure to surrounding eloquent brain tissue (Fig. 3).

Outcome and Follow-Up

Immediate Posttreatment Period

The patient tolerated the procedure well and was discharged in stable condition on March 29, 2024 with advice to avoid irritation of the irradiated site and continue prescribed medications:

1. **Levetiracetam (SRIVENTO MD 150 TAB):** 150 mg twice daily (morning and night)—antiepileptic medication
2. **Methylcobalamin + alpha lipoic acid + vitamin B6 (FENTANEURON-OD CAPS):** Once daily—neuroprotective supplementation
3. **Dexamethasone (DECMAX 4MG TAB):** 0.5 TAB twice daily, tapering over 2days—to prevent radiation-induced edema
4. **Lansoprazole (PEPTEL 400 MG TAB):** Once daily as needed—gastric protection

Follow-Up Assessment

3-Week Follow-Up (April 12, 2024)

Clinical review revealed that the patient was doing well post-SRS. She reported no new symptoms related to AVM

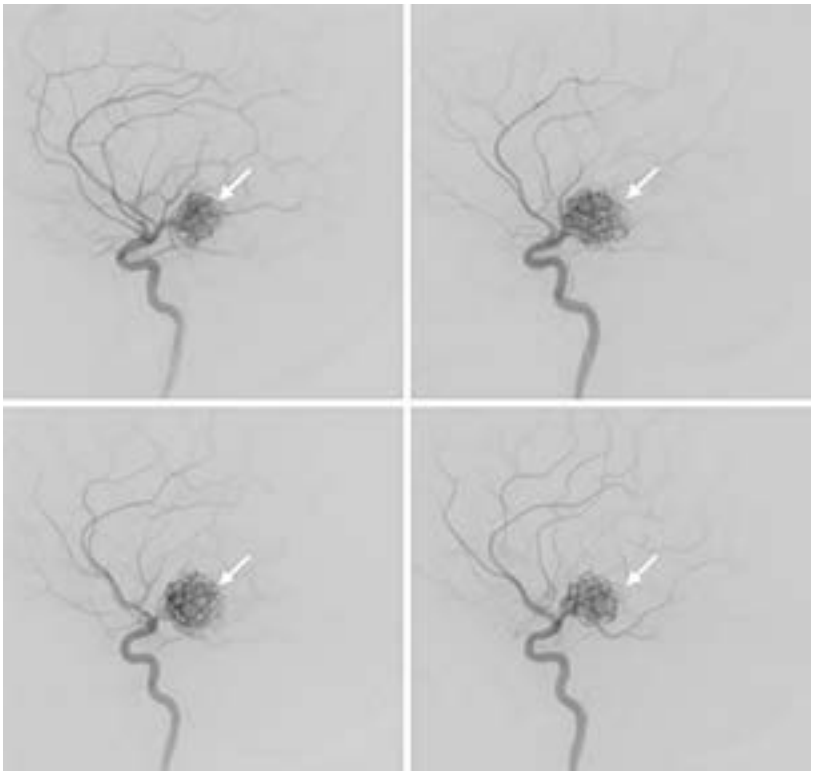

Figure 2 Four-frame digital subtraction angiography sequence depicting contrast flow through the arteriovenous malformation (AVM) in the left medial temporal lobe. Arrows mark the AVM nidus, demonstrating arterial feeders arising from the left posterior cerebral artery, the compact vascular structure of the nidus (32 mm × 25 mm × 27 mm), and early draining veins into the deep internal cerebral venous system. The sequence illustrates the hemodynamic characteristics and vascular architecture of this Spetzler-Martin Grade 3 AVM

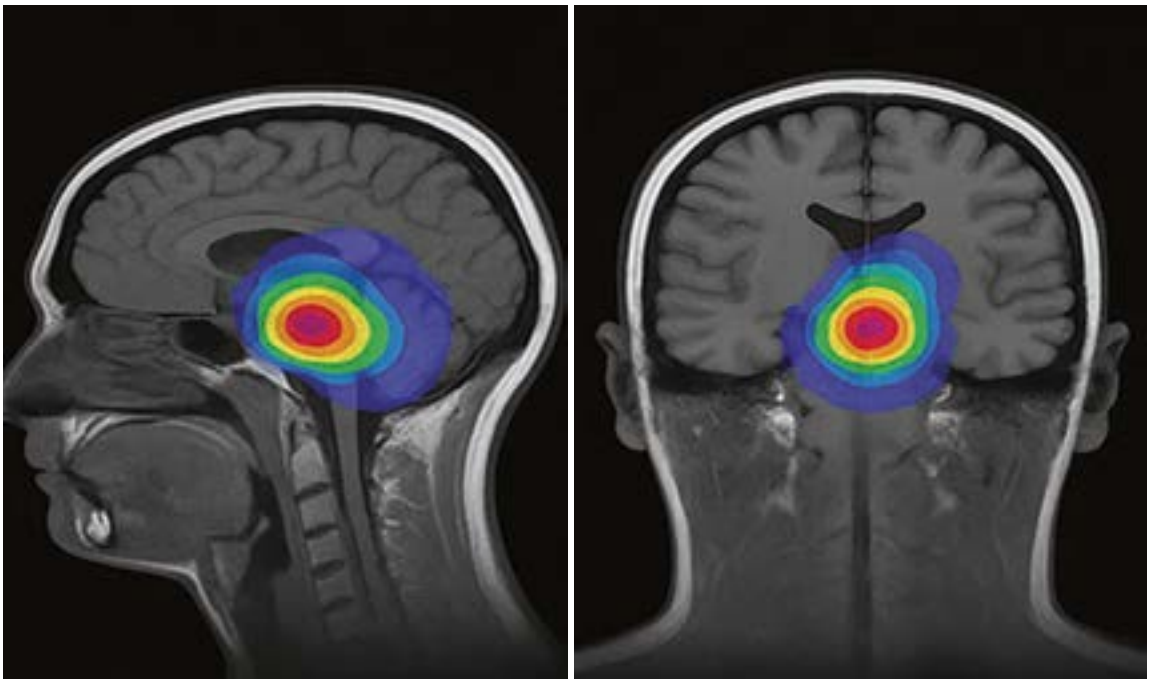

Figure 3 Treatment planning heatmap illustrating the radiation dose distribution from stereotactic radiosurgery targeting the AVM nidus in the left medial temporal lobe. The image is displayed in sagittal (left) and coronal (right) MRI views with color-coded isodose lines. The color spectrum ranges from 21 Gy (red, center of AVM nidus) to 5 Gy (purple, periphery), demonstrating the highly conformal delivery and steep dose gradient achieved with the TrueBeam system to minimize exposure to surrounding eloquent temporal lobe structures

or radiation reactions. Weight remained stable. Neurological examination showed no new deficits. She was continued on levetiracetam 150 mg twice daily with good medication compliance. Advice was given for review in the neurology outpatient department and radiation oncology after three months.

4-Month Follow-Up (July 2024)

The patient remained seizure-free with no episodes since completion of radiosurgery. Follow-up brain MRI performed in July 2024 demonstrated multiple flow voids measuring approximately 12 × 9 × 10 mm (AP × TR × CC) adjacent to the left temporal horn, representing an approximately 60–80% reduction in AVM nidus volume compared to baseline imaging. No radiation-induced edema, mass effect, or hemorrhage was noted. The patient tolerated treatment well and maintained excellent compliance with antiepileptic therapy.

6-Month Follow-Up (September 2024)

Clinical assessment confirmed continued seizure freedom. The patient reported no neurological complaints and remained on levetiracetam with good tolerance. Neurological examination remained stable with no new deficits. Weight and general health status were maintained.

12-Month Follow-Up (March 12, 2025)

Follow-up MRI of the brain demonstrated multiple flow voids adjacent to the temporal horn of the left lateral ventricle in the left temporal lobe. The size of the nidus and feeder arteries showed continued reduction compared to previous imaging. The rest of the cerebral gray and white matter showed normal signal and morphology. Ventricles appeared normal in size and configuration. CSF spaces over the cerebral convexity and around the brain stem were normal. No focal edema, hemorrhage, or radiation-induced complications were observed (Fig. 4).

Impression: In a known case of AVM poststereotactic radiosurgery (completed March 2024), the present scan revealed progressive reduction in the size of the nidus and feeder arteries, consistent with a favorable treatment response.

Current Status: The patient continues on antiepileptic medication (levetiracetam 150 mg twice daily) with excellent seizure control. No seizure episodes have been documented since the initiation of SRS treatment. Plans for definitive obliteration assessment via repeat MRI or DSA imaging are scheduled at 18–24 months post-SRS, as complete AVM obliteration typically occurs between 2 and 3 years following SRS.

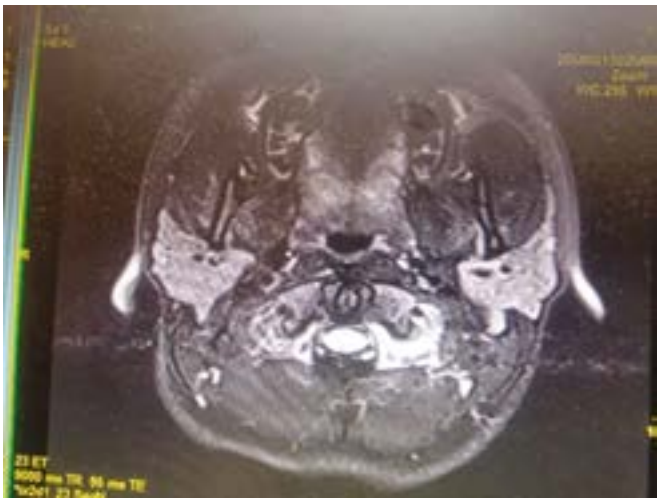

Figure 4 Follow-up brain MRI (T2-weighted axial). A T2-weighted axial MR image acquired at 12 months postradiosurgery demonstrates persistent flow voids in the medial temporal lobe, adjacent to the left lateral ventricular temporal horn, measuring approximately 12 mm (AP) × 9 mm (TR) × 10 mm (CC). The AVM nidus is stable/reduced compared to prior scans. The basal ganglia, thalami, cerebellum, and brainstem appear normal. No evidence of radiation-induced edema or mass effect is seen

Discussion

Unruptured AVMs in eloquent regions pose a therapeutic dilemma, balancing the risk of intervention against the natural course of the disease. In SM Grade 3 AVMs, particularly in the temporal lobe, SRS offers a minimally invasive alternative with acceptable obliteration rates and low morbidity. Our case highlights the importance of tailored treatment using neuroimaging, multidisciplinary planning, and longitudinal follow-up to ensure optimal outcomes.

Rationale for SRS Selection

The selection of SRS as the definitive treatment modality for this patient was based on several key clinical and anatomical factors that made SRS the optimal choice over microsurgical resection or endovascular embolization.

Eloquent Cortex Location: First, the AVM's location in the medial temporal lobe represents a highly eloquent brain region critical for memory consolidation, language function (in the dominant hemisphere), and seizure control. Microsurgical resection in this location carries a significant

risk of permanent neurological deficits, including memory impairment, language dysfunction, and potential exacerbation of seizure activity. Studies have shown that surgical resection of temporal lobe AVMs is associated with neurological morbidity rates of 15–30%, particularly when the lesion involves mesial temporal structures.[1–6]

Optimal Nidus Size for Single-Fraction SRS: Second, the compact nidus measured 3.2 × 2.5 × 2.7 cm (approximately 11 cm^3 volume) with Spetzler-Martin Grade 3 characteristics, falling within the optimal volume range for single-fraction SRS. AVMs of this size typically achieve 70–80% complete obliteration rates at 3 years when treated with margin doses of 18–22 Gy, as supported by large institutional series and the International Stereotactic Radiosurgery Society guidelines.[2–5] The compact, well-defined architecture of the nidus made it particularly suitable for conformal dose delivery.

Complex Vascular Architecture: Third, DSA demonstrated multiple arterial feeders arising from branches of the left posterior cerebral artery with deep venous drainage into the internal cerebral venous system. This vascular architecture makes surgical access technically challenging, requiring transgression through eloquent temporal lobe structures and manipulation of deep draining veins, which is associated with high operative morbidity and risk of hemorrhage during dissection.

Limitations of Endovascular Embolization: Endovascular embolization alone was deemed insufficient as a curative treatment for this patient. The compact nature of the nidus and the multiplicity of small feeding vessels arising from distal PCA branches would require multiple embolization procedures with incomplete obliteration. Furthermore, prior studies have shown that partial embolization of compact AVMs may not significantly reduce annual hemorrhage risk and can complicate subsequent radiosurgery planning by obscuring nidus margins and altering dose distribution.[3]

Risk-Benefit Analysis and Patient Factors: These factors—eloquent location, appropriate nidus size, deep arterial feeders, complex venous drainage, compact architecture suitable for radiosurgery, and the patient's young age with preference for minimally invasive treatment—collectively supported SRS as the most appropriate curative approach with an acceptable risk-benefit profile. The expected obliteration rate of 70–80% at 3 years, combined with low rates (2–5%) of permanent radiation-induced complications in temporal lobe AVMs treated with appropriate dosimetry, made SRS superior to both observation and open surgical resection for this specific patient.[2–7]The excellent clinical and radiological outcomes observed at the 12-month follow-up, with progressive nidus reduction and absence of seizures or radiation-induced complications, validate this treatment selection.

Conclusion

SRS is safe and may provide effective management of unruptured SM Grade 3 AVMs in selected cases, especially in surgically challenging regions such as the medial temporal lobe. The selection of SRS over microsurgery or embolization should be individualized based on lesion characteristics, location in the eloquent cortex, vascular architecture, nidus size, and patient factors. Our case demonstrates that SRS can achieve excellent seizure control and progressive nidus obliteration with minimal morbidity when applied to appropriately selected patients. Early diagnosis, multidisciplinary intervention, and long-term follow-up with serial imaging are crucial for favorable clinical outcomes and confirmation of complete obliteration, which typically occurs 2–3 years posttreatment.

Author Contributions

S. Muhammed Suhail conceptualized the case report, collected and interpreted clinical and imaging data, and drafted the manuscript. Gajalakhsmi M contributed to treatment documentation, assisted in manuscript preparation, and provided clinical insights from the radiation oncology department. Danish Ansari reviewed SRS dose parameters, verified technical accuracy, and critically revised the final version of the manuscript. All authors approved the final manuscript and agreed to be accountable for all aspects of the work.

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CASE REPORT

Extra of Extracorporeal: Use of VV-ECMO in Complex Tracheal Ring Resection Surgery

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Submitted: 28-Dec-2025; Accepted: 10-Feb-2026

Abstract

Background: Tracheal stenosis presents significant challenges in airway management during surgical correction, particularly when conventional ventilation compromises surgical access or gas exchange. Veno-venous extracorporeal membrane oxygenation (VV-ECMO) offers an alternative means of maintaining oxygenation independent of the airway.

Case Presentation: A 64-year-old male with a 4 cm mid-tracheal stenosis underwent tracheal ring resection under VV-ECMO support using a femoro-femoral configuration. Two prolonged apneic periods totaling 3.5 hours were successfully tolerated with stable hemodynamics and adequate oxygenation. ECMO support was continued postoperatively and weaned the following day. The patient had an uneventful recovery and was discharged on postoperative day 11.

Conclusion: VV-ECMO provides a safe and effective adjunct in complex airway surgery, enabling optimal surgical exposure while maintaining gas exchange. Its use may reduce intraoperative respiratory compromise and improve perioperative outcomes when applied by an experienced multidisciplinary team.

Introduction

Tracheal ring resection for congenital or acquired tracheal stenosis is a technically demanding procedure that requires close coordination between surgical, anesthetic, and perfusion teams. Airway management becomes particularly complex when the stenosis involves the mid-trachea, as endotracheal tube placement may compromise both surgical access and ventilation.

Extracorporeal membrane oxygenation (ECMO) has gained importance as an adjunct in airway surgery, offering full respiratory support independent of airway continuity. Veno-venous ECMO (VV-ECMO) maintains oxygenation and carbon dioxide removal, allowing surgeons to operate in a motionless and unobstructed field. Its use reduces airway manipulation and enhances safety in patients with critical airway pathology.[1–3]

We describe a case of successful VV-ECMO-assisted tracheal ring resection in an adult patient with severe tracheal stenosis, emphasizing its role in maintaining gas exchange and facilitating safe surgical exposure.

Case Report

Patient Information

A 64-year-old male presented with cough, hoarseness of voice, and dyspnea on exertion and preferred the reclining position. He had similar complaints 5 months ago. Diagnosed with inflammatory tracheal stricture, the patient was managed conservatively with steroids. Imaging and bronchoscopy revealed an inflammatory tracheal stricture causing luminal narrowing approximately 2.3 cm above the carina and 1.8 cm long tracheal wall thickening with a

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tracheal diameter of 7–9 mm, involving two tracheal rings (Figs. 1–3). Hence tracheal resection was planned.

Preoperative Planning

Due to the high risk of airway compromise during induction and the likelihood of prolonged apnea, a multidisciplinary team comprising anesthesiologists, thoracic surgeons, and perfusionists decided to use VV-ECMO support.[4]

A femoro-femoral configuration was selected to allow unhindered surgical access to the neck and upper thorax.[5]

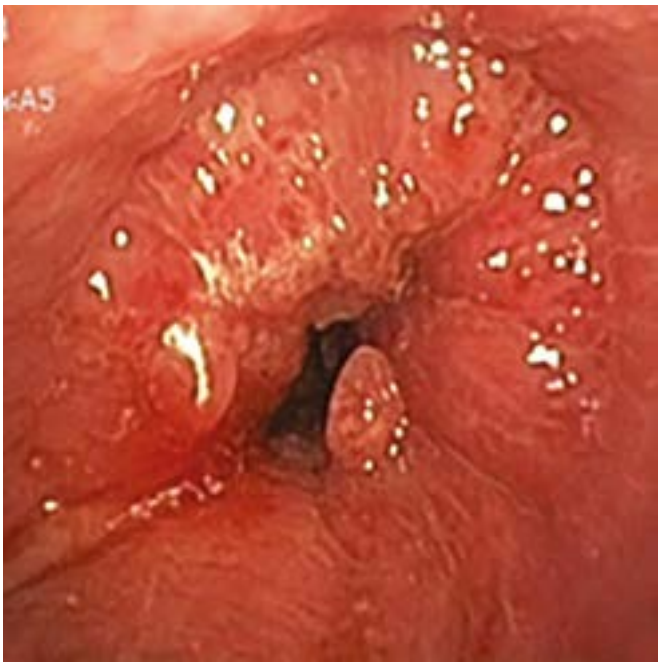

Figure 1 Bronchoscopy image showing narrowing of trachea

Anesthesia Management

Before induction, both femoral veins were cannulated with a 5 Fr femoral sheath for ECMO cannulation, and ECMO (Maquet PLS ECMO kit) was kept primed before induction. The right IJV and right radial artery were also cannulated. After all emergency preparations, the patient was initially induced under general anesthesia using a laryngeal mask airway. Mask ventilation was adequate; hence, LMA was placed. As the patient was maintained on mask ventilation and LMA with stable hemodynamics, ECMO was initiated post-induction. Subsequently, endotracheal intubation was performed using ETT size 7 with the aid of a fiberoptic laryngoscope through the LMA to minimize the risk of trauma to the stenotic lesion. Anesthesia was maintained with total intravenous anesthesia (TIVA) using infusions of remifentanil, propofol, and dexmedetomidine during the apneic phase and with inhalational agents during periods of spontaneous or controlled ventilation.

The ETT was withdrawn slightly during resection and advanced once the anastomoses were completed. During both apnea phases, the tube was disconnected from the ventilator as ECMO was initiated and able to provide adequate oxygenation (perfuse the patient).

ECMO Management

After standard induction and intubation, 3000 IU of unfractionated heparin was administered to maintain an activated clotting time (ACT) between 160–180 seconds, avoiding excessive anticoagulation. Flows of 4 L/min were maintained throughout the ECMO run.

VV-ECMO was initiated using a 21 Fr return cannula in the right femoral vein and a 25 Fr drainage cannula in the left femoral vein. Femoro-femoral cannulation was preferred

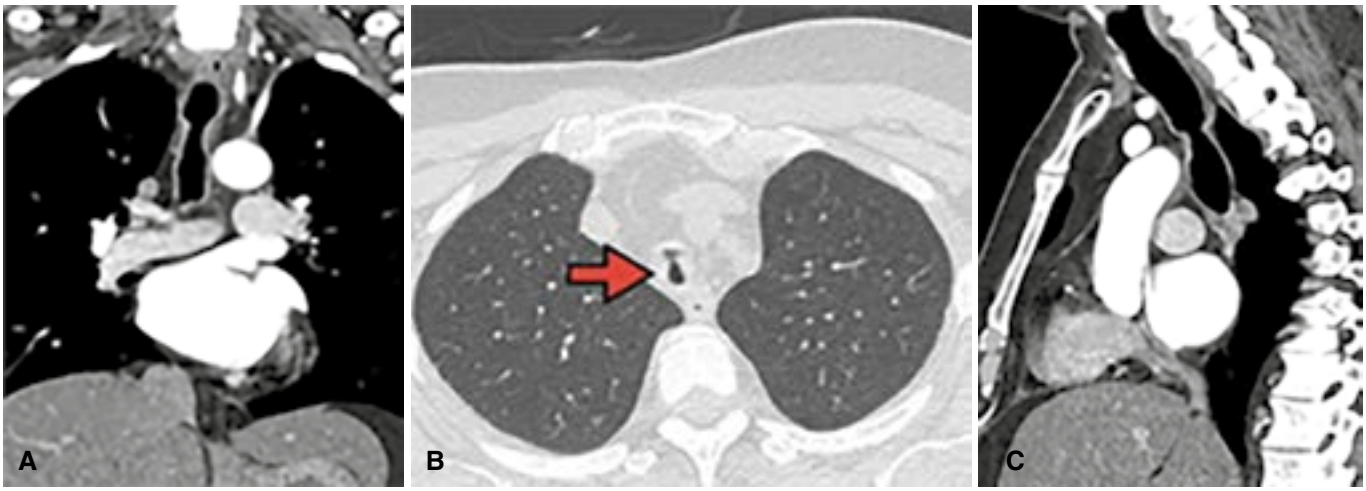

Figure 2 CT scan images showing the tracheal narrowing

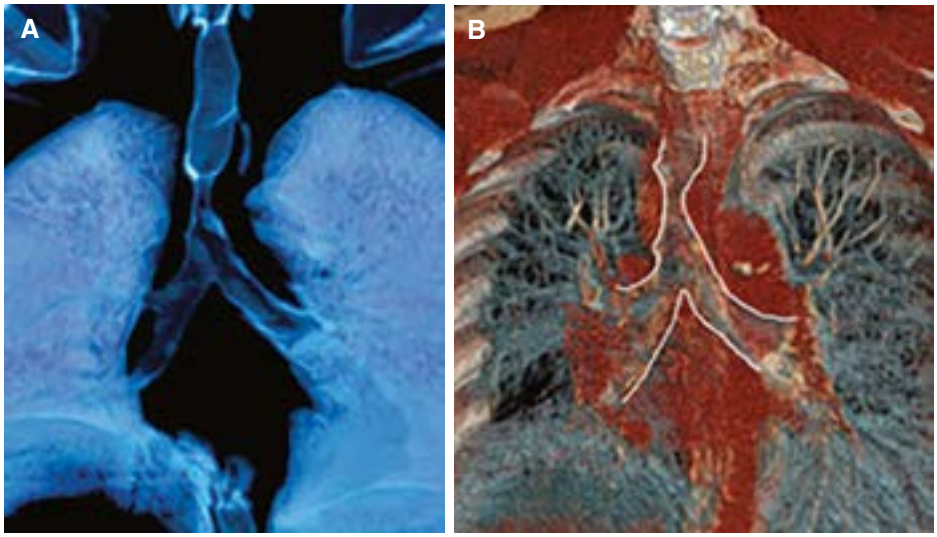

Figure 3 PET scan images showing narrowing of trachea.

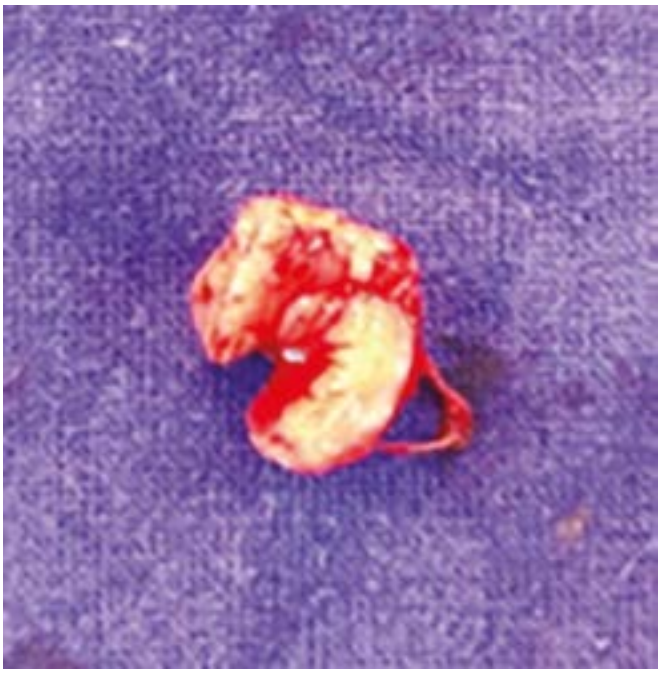

Figure 4 Narrowed tracheal ring which was removed

over femoro-jugular cannulation to ensure an unobstructed operative field.

VA-ECMO can also be used, but as the patient had good cardiac function, there was a possibility of developing Harlequin (North-South) syndrome.[6]

Cardiopulmonary bypass (CPB) could have been another alternative to ECMO, but with CPB being an open circuit compared with ECMO, there is a chance of an increase in systemic inflammatory response syndrome (SIRS), and it also requires a high ACT range (>480 s), which can cause bleeding risk at the operative site and can obstruct the view. A key advantage of ECMO is its ability to be continued post-procedure in the ICU, if required.[6]

An initial 15-minute apnea trial demonstrated stable hemodynamics and gas exchange. The patient was positioned right-up lateral for thoracotomy; the first apnea period lasted 60 minutes with stable parameters, ABGs and hemodynamics (Table 1, ABG no 2).[3,7] After repositioning to the supine position, a second apnea of 150 minutes was tolerated (Table 1, ABG no 3) uneventfully (Fig. 5).

Flows were maintained at 4 L/min throughout the ECMO run with a sweep gas flow of 4 L/min and FiO_2 100%. Blood gases were measured hourly alongside the ACT to monitor the anticoagulation requirements. ACT was maintained for 160–180 s. No heparin or any other anticoagulant was required except the initial dose for cannulation (3000 IU).

Four units of PRBCs were kept ready alongside other blood products. One unit of PRBC was transfused to catch up with the loss of blood during the surgery (700 ml approx.)

Surgery was completed successfully, and the patient was transferred to the intensive care unit (ICU) with ongoing ECMO support.

Postoperative Course

The sweep gas was discontinued four hours after ICU transfer, but ECMO flows were kept the same to avoid anticoagulation. A follow-up bronchoscopy performed the next day showed no anastomotic leaks or bleeding. The patient was successfully weaned from ECMO and decannulated. He recovered without complications and was discharged home on postoperative day 11.

Table 1 Arterial Blood Gases during the Surgery and ECMO Run.

Time	pH	PCO_2	PO_2	SO_2	$–HCO_3$	BE	Hb	K^+	Lactate
–1.00	7.37	35.2	92.8	98.9	20.0	–4.1	12.1	3.8	1.1
1.00	7.39	30.7	86.5	98.7	18.8	–4.8	13.4	4.1	1.7
4.00	7.33	37.0	79.4	94.1	19.8	–6.8	12.6	3.6	2.9
6.00	7.49	25.5	145	97.7	19.2	–3.0	8.8	4.2	2.9
8.00	7.45	26.7	163	98.9	17.9	–4.7	9.3	3.8	3.9

Figure 5 Intraoperative hemodynamic monitoring during the first apnea

Discussion

Airway surgery presents unique anesthetic and surgical challenges because ventilation and operative exposure often compete for access to the tracheal lumen.

Conventional approaches have drawbacks, particularly in mid-tracheal lesions:

1. Distal tracheal intubation: Tubes may be too large for smaller airways or obstruct the operative field.
2. Cross field ventilation: Limited exposure and the possibility of insufficient oxygenation.
3. High-frequency jet ventilation: Unreliable gas exchange and barotrauma risk.

VV-ECMO offers distinct advantages in such situations:

1. Unobstructed surgical field: Eliminates the need for an endotracheal tube across the operative site.
2. Stable and uninterrupted gas exchange: Allows prolonged apnea while maintaining oxygenation and CO_2 clearance.
3. Hemodynamic stability: Reduces the risk of airway collapse during induction and manipulation.

Despite these advantages, ECMO is not without risks. Use of ECMO requires careful management:

1. Anticoagulation management: Balancing clotting risks with bleeding complications.
2. Cannulation risks: Vascular injury, bleeding, or hemolysis.
3. Other risks: Infection, thrombosis, or mechanical issues.

However, with proper planning and expertise, VV-ECMO significantly improves safety and outcomes in tracheal surgeries. A multidisciplinary team's coordination is essential to the success of VV-ECMO in complex tracheal surgeries. Surgeons, anesthetists, perfusionists, and intensivists work together to plan, carry out, and oversee the procedure to ensure smooth transitions, prompt interventions, and the best possible patient outcomes through clear communication and a shared understanding of standards of care.

Conclusion

The use of veno-venous extracorporeal membrane oxygenation (VV-ECMO) during tracheal ring resection represents a safe and effective adjunct for maintaining adequate oxygenation and ventilation in scenarios where conventional airway management is difficult or carries significant risk. By ensuring stable gas exchange and providing a controlled physiological environment, VV-ECMO facilitates precise execution of complex airway reconstruction while optimizing surgical exposure. Its application may reduce the risk of intraoperative hypoxia and hypercapnia and contribute to improved perioperative outcomes. When employed by an experienced multidisciplinary team, VV-ECMO constitutes a valuable addition to the armamentarium of modern airway surgery.

Overall, the case report is poorly written and structured. For a technical paper, this deserves description with proper sequence of the procedures. There is mix-up of anesthesia management and ECMO management. The discussion is generic and presented as teaching slides about ECMO. No discussion about the case, hardly any literature synthesis.

Acknowledgments

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CASE REPORT

Isolated Giant Aneurysm of the Acute Marginal Branch of Right Coronary Artery Presenting as NSTEMI: Successful Direct Surgical Repair Preserving the Native Flow

Saikumari Nagaraj, Saranya Damodaran, and Anbarasu Mohanraj

Submitted: 31-Dec-2025; Accepted: 14-Feb-2026

Introduction

Coronary artery aneurysms (CAAs) are defined as focal dilatations of a coronary vessel segment exceeding approximately 1.5 times the diameter of the adjacent normal segment. The prevalence of CAAs detected via coronary angiography ranges between approximately 0.3% and 5%. Among these, so-called "giant" CAAs (GCAAs) are far more uncommon; reported series estimate an incidence of approximately 0.02% to 0.2%.[1] GCAAs most commonly involve the proximal segment of the right coronary artery (RCA), followed by the left anterior descending (LAD) and left circumflex (LCX) arteries. Etiologically, atherosclerosis is the predominant cause in adults; less frequent causes include vasculitis (e.g., Takayasu arteritis and Kawasaki disease in younger patients), infection (mycotic), trauma, and postintervention changes.[2] Clinically, GCAAs may be silent and found incidentally, but they carry a risk of serious complications, including thrombus formation with distal embolization, myocardial infarction, coronary steal phenomena, compression of adjacent cardiac structures, dissection, fistula formation, and rupture. Because of these risks and the scarcity of cases, there is no widely accepted standard guideline for management. Treatment decisions are typically individualized based on aneurysm size, symptoms, growth, location, presence of complications, and patient comorbidities. In symptomatic cases—especially those presenting with ischemia (e.g., acute coronary syndrome [ACS]), large or rapidly enlarging aneurysms, or those involving critical segments (e.g., left main trunk)—surgical intervention (resection, ligation, and exclusion with bypass grafting) is often favored.[3] Given the rarity of branch vessel GCAAs (such as those arising in the acute marginal branch of the RCA), reports of direct surgical repair with preservation of native coronary flow (without bypass grafting) are extremely limited and thus merit documentation.

Case Presentation

A 61-year-old woman with type II diabetes mellitus and systemic hypertension presented with breathlessness and chest pain radiating to the back for one month. She had been previously admitted with ACS, non-ST elevation myocardial infarction (NSTEMI). During this admission, the patient developed acute pulmonary edema with hypoxia and transient unresponsiveness, attributable to acute heart failure rather than a direct mass effect of the aneurysm. After conservative management, coronary angiography demonstrated a giant saccular aneurysm (6 × 4 cm) arising from the acute marginal branch of the distal RCA, without obstructive coronary artery disease. Her history was negative for infection or vasculitis. She was referred for surgical intervention. She had no prior history of coronary angioplasty, stent implantation, or cardiac surgery.

On admission: HR 88/min, BP 110/80 mmHg, RR 22/min, SpO_2 89% (room air), and Temp 97°F. Cardiovascular and respiratory examinations were unremarkable; there were no neurological deficits.

Laboratory findings: Hb 11.6 g/dL; WBC 10.54 × 10^9/L (neutrophils 89%); platelets 207 × 10^9/L; PT 10.8 s; INR 0.93; APTT 25.5 s; HbA1c 7.2%; urea 44 mg/dL; creatinine 0.59 mg/dL; and potassium 3.15 mEq/L.

ECG: sinus rhythm at 85 bpm with T-wave inversion in inferior leads.

Echocardiography: concentric LV hypertrophy with preserved LV systolic function (EF 60%).

Coronary angiography: Codominant coronary circulation was demonstrated. The left main coronary artery bifurcates into the LAD and LCX arteries. The LAD is a type II vessel. The LCX is codominant, giving rise to a posterior left ventricular (PLV) branch (Fig. 1A).

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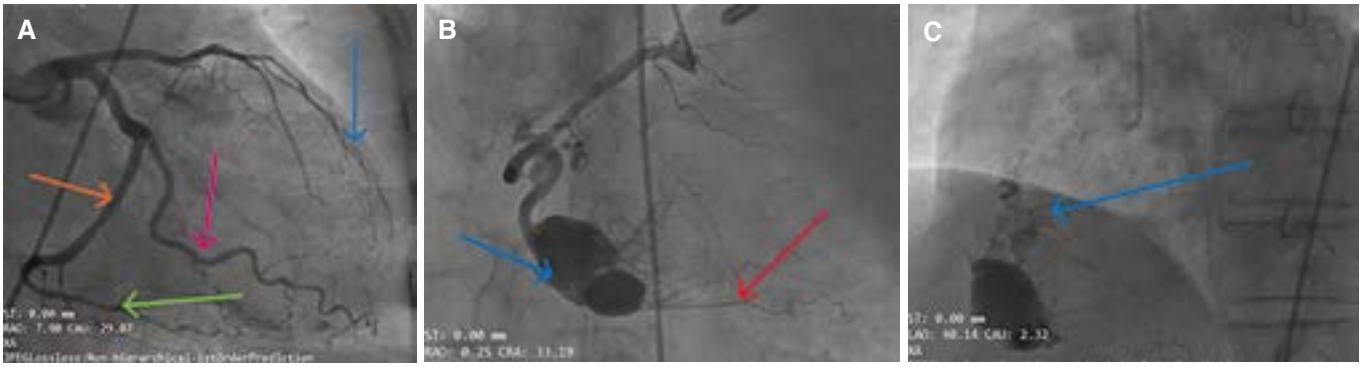

Figure 1 Coronary angiography (clockwise from the top left corner). (A) LMCA injection (blue, LAD; orange, LCX; pink, OM; green, LPLV) documenting no significant left-sided atherosclerotic changes. (B) RCA injection (blue arrow indicates a giant aneurysm mimicking an RCA aneurysm and red arrow indicates RPDA). (C) Stasis inside the aneurysm showing large feeding arteries to the aneurysm. LMCA, LAD, left anterior descending; LCX, left circumflex; OM, LPLV, RCA, right coronary artery; RPDA

The RCA continues and gives rise to the posterior descending artery (PDA) (Fig. 1B).

At the origin of the acute marginal branch, very close to the RCA trunk, there is a giant saccular aneurysm, which receives multiple feeding vessels from the distal RCA/acute marginal region (Fig. 1C). There were no flow-limiting stenoses or atherosclerotic lesions in any of the coronary vessels.

Surgical Technique

As per institutional protocol, the patient was induced with anesthetic agents. A standard median sternotomy and pericardiotomy were performed, followed by systemic heparinization. Cardiopulmonary bypass (CPB) was instituted using aortic and double-staged single venous cannulation. The aorta was not cross-clamped. The RCA was identified and traced from its origin along its entire course to the PDA.

A giant saccular aneurysm measuring 6 × 4 cm was visualized, arising separately from the acute marginal branch immediately adjacent to the distal RCA trunk (Fig. 2).

Proximal control of the RCA was obtained using a vascular sling. The aneurysmal sac was opened, and a representative portion of the wall was excised and sent for histopathological examination. Within the sac, four major feeding vessels and multiple smaller channels were identified; each was meticulously ligated from within (Fig. 3).

These were differentiated intraoperatively from essential branch vessels by direct visualization of low-flow channels entering the sac, absence of significant back-flow on temporary occlusion, and preservation of antegrade distal RCA and PDA perfusion. After confirming complete exclusion of the aneurysm, the sac margins were cauterized to eliminate residual flow (Fig. 4).

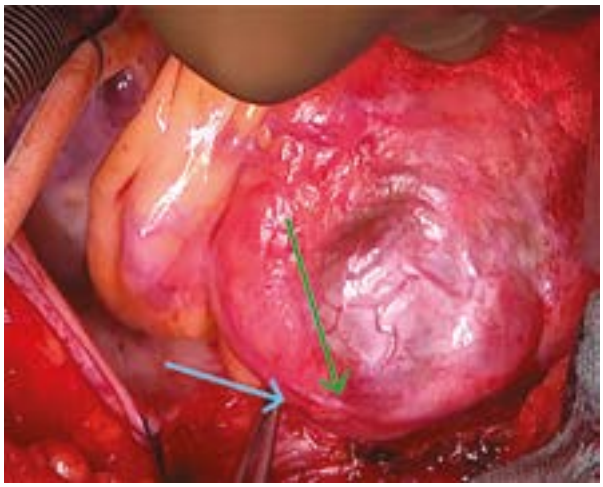

Figure 2 Blue arrow: RCA, green arrow: origin of acute marginal artery with giant aneurysm

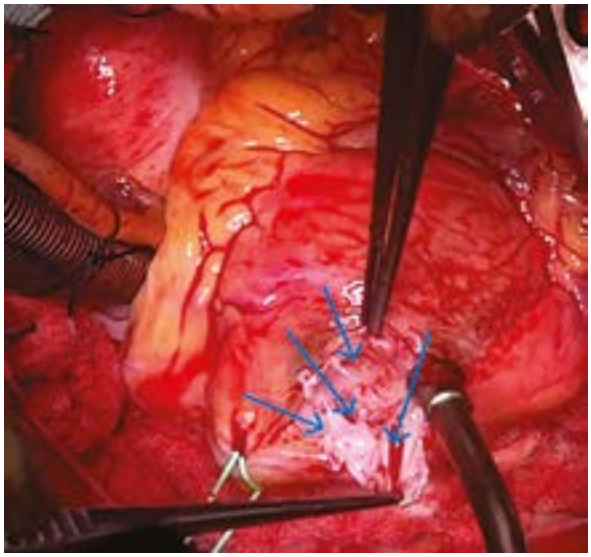

Figure 3 Four major feeding vessels to the aneurysm

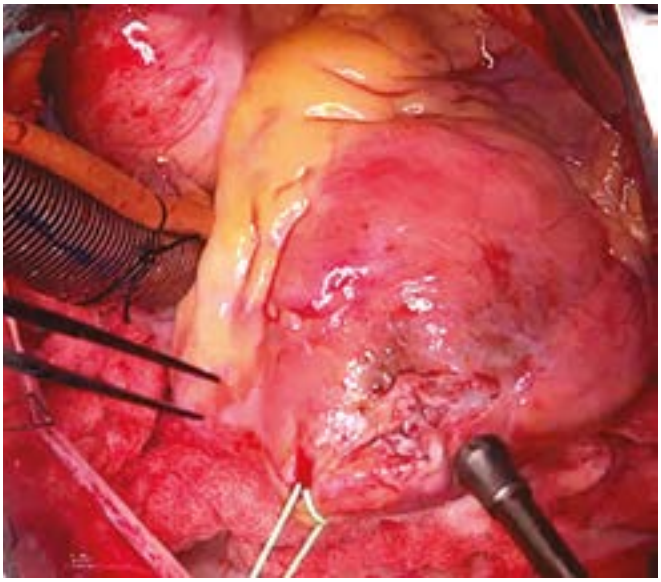

Figure 4 Aneurysm sac showing postligation of feeding vessels

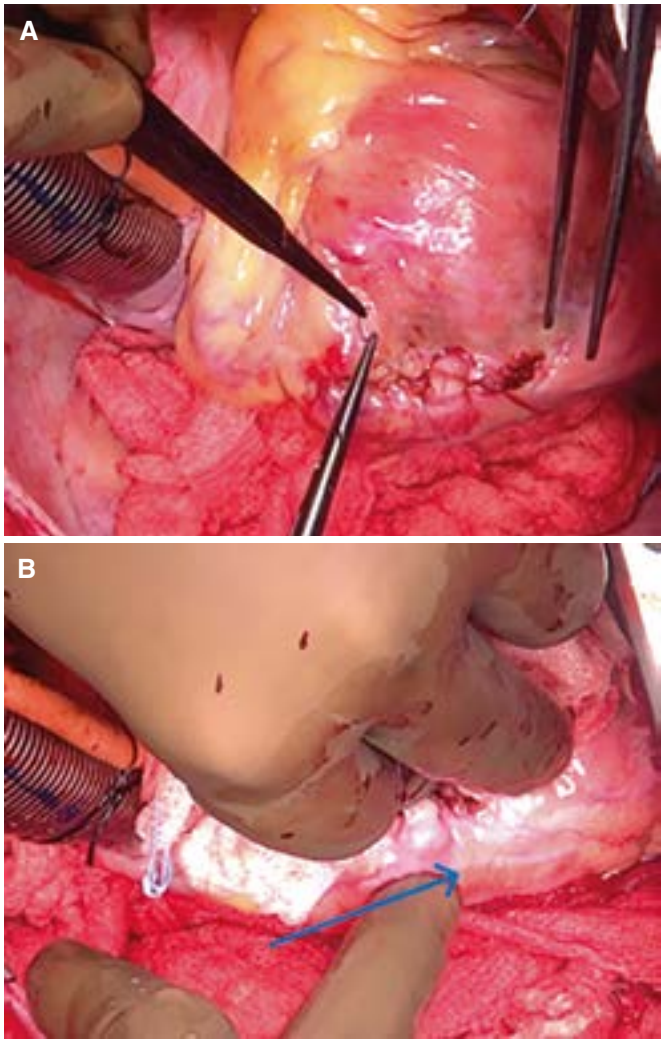

Figure 5 (A) Aneurysmal sac primary approximation; (B) patent RCA depicting that no damage to the RCA occurred, compromising its flow

Once complete exclusion was confirmed, the sac was then closed by primary approximation to obliterate dead space, prevent postoperative hematoma, and ensure safe anatomic reconstruction after complete exclusion.

The native RCA flow was preserved and remained patent throughout (Fig. 5B).

Complete excision and reconstruction of the aneurysm would have required the sacrifice of the acute marginal branch and potentially jeopardized distal RCA perfusion. Given the small caliber of the branch and preserved native flow, bypass grafting was not performed. The patient was successfully weaned off CPB with stable hemodynamics and no ST segment changes on monitoring. Intraoperative assessment demonstrated normal biventricular function; hence, bypass grafting was deemed unnecessary.

Postoperatively, the patient was extubated three hours after surgery and had an uneventful recovery. Histopathology and microbiology reports ruled out any evidence of recent infection, vasculitis, or systemic inflammatory disease.

She was discharged on postoperative day 4 with dual antiplatelet therapy (aspirin-clopidogrel) as secondary prevention following NSTEMI, metoprolol 12.5 mg daily, and rosuvastatin 20 mg daily.

Discussion

The first pathologic description of a CAA was by Morgagni in 1761, and the first clinical case of a CAA was reported by Bourgon in 1812. CAA is an uncommon disease, although it has been diagnosed with increasing frequency since the advent of coronary angiography. GCAAs are rarely seen. The risk of adverse events in CAAs is driven by mechanisms including thrombus formation within the dilated sac with distal embolization, altered flow kinetics ("coronary steal" phenomenon) reducing distal perfusion, external compression of adjacent structures, and dissection or rupture of the aneurysm wall.[1–4] Our patient's presentation with ACS in the absence of obstructive coronary disease was most likely related to altered coronary flow dynamics and transient ischemia caused by the giant aneurysm rather than frank plaque rupture.

Branch Vessel Significance

Although branch vessels may be of smaller caliber, their contribution to myocardial perfusion can be clinically meaningful. Large branch vessel aneurysms may precipitate ischemia through distal embolization or altered competitive flow. As demonstrated here, branch aneurysms warrant diagnostic consideration and therapeutic intervention when symptomatic.

Diagnosis and Imaging

Conventional coronary angiography remains the gold standard to define the anatomy of CAAs, yet adjunctive imaging (CT angiography, MRI, intravascular ultrasound) may help to assess aneurysm size, relation to adjacent structures, thrombus content, and feeding/branch vessels.[5] Since our case presented with NSTEMI, a conventional coronary angiogram remains the gold standard. In our case, the angiogram clearly demonstrated a codominant system, no obstructive disease, and a giant aneurysm at the origin of the acute marginal branch, thus driving the decision for intervention.

Management Considerations

Because of the rarity of GCAAs, there are no prospective randomized trials or consensus guidelines. Management remains individualized based on symptoms, aneurysm size/growth, location (especially left main involvement), morphology (saccular/fusiform), presence of complications (e.g., rupture and fistula), and patient comorbidities.[4]

Broadly, the management options are as follows:

1. **Medical/conservative therapy:** Applicable to asymptomatic patients, small stable aneurysms without highrisk features. This typically includes antiplatelet therapy, anticoagulation when thrombus risk exists, and risk-factor modification (hypertension, diabetes, and dyslipidemia).[5]
2. **Surgical/percutaneous intervention:** Indicated in symptomatic patients (ischemia/ACS), large/giant aneurysms, involvement of critical vessels (left main), rapidly growing aneurysms, or evidence of rupture/fistula. Surgical options vary depending on morphology, as it may influence therapeutic choices, with saccular aneurysms more amenable to surgical exclusion or coil-based strategies when surgical risk is high or anatomy favorable,[5] whereas fusiform aneurysms may require bypass or segmental reconstruction.[5,6]

In our case, surgical management was favored due to symptomatic presentation (NSTEMI), giant aneurysm size, multiple feeding vessels, branch vessel anatomy, and feasibility of preserving native myocardial perfusion without grafting. Percutaneous coil or covered stent deployment was considered less suitable due to the complex branch vessel geometry and risk of compromising the RCA or PDA.

Rationale for Off Pump versus On Pump

Although off-pump surgical exclusion of coronary aneurysms has been described in selected reports, CPB without aortic cross-clamping was chosen in this case to allow controlled inspection of multiple feeding vessels, precise intraluminal ligation, and hemodynamic stability during manipulation near the distal RCA. Given the aneurysm size and complex branch anatomy, this approach was considered the safest strategy.

Rationale for Surgical versus Interventional Choice in This Case

Several features supported surgical repair rather than percutaneous exclusion:

1. The aneurysm was giant, located adjacent to the RCA, with multiple feeding vessels, potentially complicating percutaneous exclusion or coil embolization.
2. The branch involved (acute marginal) was of sufficient caliber and complexity to make stent deployment challenging (risk of sidebranch compromise).
3. Preservation of native coronary perfusion without grafting was feasible and desirable.

Medical Therapy and Statin Use

Statins were prescribed for secondary prevention following ACS to reduce inflammation in coronary arteries rather than for aneurysm-specific indications.[7] Current literature does not mandate routine statin therapy for CAAs in the absence of concomitant atherosclerosis; however, cardiovascular risk-factor modification remains essential.

Prognosis and Follow-Up

The natural history of GCAAs is not well defined; some reports indicate a poor outcome if left untreated (e.g., spontaneous rupture, infarction, and sudden death), although the exact rates are unclear. Long-term outcomes for surgical or interventional management appear favorable, but follow-up data remain limited. In one series of covered stents, the major adverse cardiac event (MACE) rate was ~26 % at ~13 months.[8] Close follow-up is essential, with serial imaging (CT angiography or coronary angiography), functional assessment, and aggressive risk-factor management.

Key Learning Points

1. Aneurysms of branch coronary vessels, even when "small" in caliber relative to main trunks, may become clinically significant if they are large in size and feed the myocardium.

2. In patients presenting with ACS without obstructive coronary disease, alternative mechanisms, including coronary aneurysms and altered coronary flow dynamics, should be considered and evaluated when clinically appropriate.
3. Multimodal imaging and careful planning are crucial in selecting between surgical versus percutaneous approaches.
4. In GCAAs presenting with ischemia, timely intervention (whether surgical or percutaneous) is generally preferred over conservative therapy.
5. The interventional (percutaneous) arm, including covered stents or coil embolization, is a viable alternative to surgery, especially in patients at high surgical risk, but requires careful patient selection, expert technique, and long-term follow-up.
6. Histopathologic evaluation (in surgical cases) helps exclude uncommon causes (infection and vasculitis) and informs risk stratification.

Conclusion

Timely repair of a GCAA is critical. While many coronary aneurysms may remain silent, those of considerable size, especially when presenting with ischemia/ACS or involving proximal or branch vessels, carry a substantial risk of adverse events. The literature demonstrates that early surgical or percutaneous intervention in appropriately selected patients leads to excellent short- and long-term outcomes. In our case, prompt recognition of the giant saccular aneurysm arising from the acute marginal branch of the RCA, followed by direct surgical repair preserving native coronary perfusion, resulted in an uneventful recovery.

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Knowledge, attitude and practice of Physician Associates regarding infection control measures in clinical settings

Abstract ID: 36
Submitted: September 25, 2025
Author: Aleena Laiju

Background: Infection control is critical to preventing healthcare-associated infections (HAIs) and safeguarding both patients and staff. Standard precautions—hand hygiene, use of personal protective equipment (PPE), safe sharps handling, respiratory hygiene and environmental cleaning—form the foundation of infection prevention but are often inconsistently followed. Physician Associates (PAs), as frontline clinicians, are uniquely positioned to model and enforce these practices. Because they maintain frequent patient contact and perform diverse procedures, infection control is not only vital for their own protection but also makes them key agents in breaking chains of transmission.

Aim: This study aimed to assess the knowledge, attitudes and practices (KAP) of Physician Associates regarding infection control measures across different clinical settings.

Materials and Methods: A prospective, cross-sectional study was conducted among Physician Associates staff and students working in various departments of Amrita Institute of Medical Sciences (AIMS), Kochi, in collaboration with the Department of Infectious Diseases. Data were collected through a validated online questionnaire distributed via Google Forms.

Result: Descriptive analysis of 42 participants showed a mean knowledge score of 20.36 ± 3.04, an attitude score of 32.74 ± 5.06 and a practice score of 17.31 ± 2.85. Mann–Whitney U tests revealed no significant differences in KAP scores between age groups (<22 vs. ≥ 22 years; $p > 0.05$). Gender-wise, females had slightly higher mean scores across all domains, but differences were not statistically significant except for practice scores ($p = 0.008$).

Conclusion: Participants demonstrated generally good knowledge, positive attitudes and satisfactory practices in infection control, with little variation across demographic groups. Although limited by a small sample size ($n = 42$), the findings point to the need for continued training and institutional support to translate knowledge into consistent, everyday safe practices among Physician Associates.

Physician Assistants in the clinical evaluation of non-obese children: comparing sleep apnea and primary snoring profiles

Abstract ID: 33
Submitted: September 24, 2025
Author: Thivyatharshini B

Introduction: Obstructive sleep apnea syndrome (OSAS) is a sleep-related breathing disorder characterized by repeated episodes of upper airway obstruction leading to intermittent hypoxia and hypercapnia. While obesity is a known risk factor, the clinical consequences of OSAS in non-obese children remain underexplored.

Aim: This study aimed to compare the clinical and metabolic profiles of non-obese children with OSAS and those with primary snoring.

Methods: A Comparative study was conducted between March 2025 and August 2025, enrolling 52 children aged 3–13 years with BMI ≤95th percentile with their parents' consent. All participants were habitual snorers for ≥6 months. Children with obesity, diabetes, cardiovascular, metabolic, or neuromuscular disorders, genetic syndromes, or craniofacial malformations were excluded. Assessments included ENT examination, blood pressure measurement, polysomnography, and fasting blood analysis (glucose, insulin, lipid profile, thyroid function, hemoglobin [Hb], and hematocrit [Hct]). OSAS was defined as apnea-hypopnea index (AHI) ≥1, with severity categorized as mild (1–5), moderate (5–10), or severe (>10). Statistical analyses included Mann-Whitney, Kruskal-Wallis, and Spearman correlation tests, with significance set at $p < 0.05$.

Results: Out of 52 children, 24 had OSAS (11 mild, 7 moderate, 6 severe) and 28 were primary snorers. Hypertrophied lymphoid tissue was the main cause of obstruction. Blood pressure was normal in both groups. Significant differences were observed for Hb ($p = 0.004$), Hct ($p = 0.024$), HDL ($p = 0.009$), and VLDL ($p = 0.049$), with higher VLDL in the OSAS group. Correlation analysis revealed a fair negative correlation between OSAS severity and insulin ($r = –46.6\%$, $p = 0.022$) and a fair positive correlation with free T4 ($r = 40.5\%$, $p = 0.049$).

Conclusion: Non-obese children with OSAS demonstrate subtle but significant hematologic and metabolic alterations compared to primary snorers, despite normal blood pressure. These findings highlight the importance of early recognition and monitoring of OSAS in non-obese pediatric populations.

Keywords: Obstructive sleep apnea syndrome, non-obese children, polysomnography, VLDL, insulin resistance.

Understanding the spectrum of Physician Assistant perspective about post operative complications and outcomes after pancreaticoduodenectomy

Abstract ID: 32
Submitted: September 24, 2025
Author: S. Mahalakshmi

Abstract

Introduction: Pancreaticoduodenectomy (PD) is a technically demanding procedure requiring intensive postoperative care. In developing countries, limited resources and inadequate postoperative management contribute to poor surgical outcomes.

Aim: To evaluate postoperative complications and outcomes among patients undergoing pancreaticoduodenectomy in a tertiary care hospital of a developing country.

Objectives: To analyse the complication and outcomes of post op.

Methods

Study Population: 5 Patients who underwent pancreaticoduodenectomy (PD) for ampullary, periampullary, or pancreatic tumors. Excluded patients with advanced metastases or unresectable tumors.
Study period: February 2024–July 2025.

Data Collection

Demographic details: age, gender.
Presenting symptoms: jaundice, abdominal pain, and others.
Complications recorded: Surgical Site Infections, anastomotic leaks, pancreatic fistulas, cholangitis, biliary leaks.

Results

Patient demographics: Among the 5 patients, the mean age was 62.4 years (range 55–71 years), with 3 males and 2 females.
Presenting symptoms: Jaundice was the most common presentation (60%), followed by abdominal pain (40%) and weight loss (40%).
Tumor characteristics: All patients had resectable periampullary or pancreatic head tumors; mean tumor size was 3.2 cm.
Comorbidities: Hypertension (40%) and Diabetes Mellitus (20%) were the most frequent.

Postoperative complications

Surgical site infection: 2 patients (40%)
Pancreatic fistula: 1 patient (20%)
Delayed gastric emptying: 1 patient (20%)
Bile leak, anastomotic leakage, and cholangitis: none reported

Conclusion: Postoperative complications such as infections, leaks, and fistulas are common after PD and significantly contribute to morbidity and mortality. These complications are often preventable with improved surgical techniques, better intraoperative hemostasis, aggressive postoperative care, and a multidisciplinary management approach. Strengthening postoperative infrastructure and care protocols is essential to improve outcomes in developing countries.

Keywords: Postoperative outcomes, Periampullary tumors, Pancreatic tumors, Obstructive jaundice.

"The contribution of Physician Assistants to assessing and optimizing the reliability of reverse sural artery fasciocutaneous flap outcomes in older non-diabetic patients"

Abstract ID: 31
Submitted: September 24, 2025
Author: Ashina Begum AS

Introduction: The reverse sural artery fasciocutaneous (RSAF) flap is widely used for reconstruction of soft tissue defects in the distal lower extremities. Its versatility, ease of harvest, and reliability make it a preferred option. However, most studies focus on younger patients, while data on older adults remain scarce. With the increasing prevalence of lower extremity trauma, chronic wounds, and comorbidities in the elderly, evaluating the role of the RSAF flap in this population is clinically important.

Aim: To evaluate the clinical application and reliability of the RSAF flap in older adult patients with soft tissue defects of the lower extremities. To assess flap survival in older adult patients (≥60 years).

Methods: A Research was carried out on 56 patients aged 60 years and above who underwent reverse sural artery fasciocutaneous (RSAF) flap reconstruction for lower extremity soft tissue defects between February 2025 and July 2025. Detailed data were collected from medical records, including demographic characteristics (age, gender), comorbidities (such as diabetes mellitus, hypertension, peripheral vascular disease), and risk factors like smoking history and previous surgeries. Clinical outcomes assessed included flap survival rates, wound healing patterns, and postoperative complications such as infection, partial flap necrosis, and wound dehiscence. All data were systematically analyzed to evaluate surgical safety and reliability.

Results: A total of 56 older patients underwent reconstruction with RSAF flaps. Overall, 71.4% of flaps healed primarily. The most common complications were wound dehiscence, marginal necrosis, and venous congestion, seen in 42.9% of patients. All complications were successfully managed with skin grafting and resuturing. Importantly, all flaps survived providing stable coverage.

Conclusion: The RSAF flap is a reliable, safe, and effective option for soft tissue reconstruction of the lower extremities in older adults. Although complication rates are higher due to comorbidities and impaired healing.

Keywords: Fasciocutaneous flap, soft tissue defect, older adults, Wound complications.

Pressure injury prevention and management – best practice guidelines

Abstract ID: 30
Submitted: September 21, 2025
Author: Ms Kshitija Pawar

Background: Pressure injuries (bed/pressure sores), a prevalent concern in both hospital & long term care settings, result from localized damage to the skin & underlying soft tissue, primarily occurring over bony prominence or related to medical devices. These injuries can lead to significant reduction in the patient's quality of life, impose substantial costs on both patients & the healthcare system, & even increase morbidity & mortality.

Materials and Methods: A retrospective analysis was conducted to investigate the best practice guidelines for pressure injury prevention & management from january 2021 to september 2025. The pressure injury committee program introduced in 2021 which included evidence-based interventions such as standardized risk assessments (e.g, Braden scale), staff education and training, implementation of pressure-relieving devices, skin care protocols, & multidisciplinary team involvement. Data were collected on the incidence, staging, types of PI, healing rates, & recurrences of PI. Trends were analysed annually & outcomes were compared with baseline data prior to PI committee formation.

Results: In this study, following implementation of the program – the overall incidence of hospital-acquired pressure injuries related to positioning reduced by 83%. Stage III & IV injuries showed the most significant reduction. Incontinence associated dermatitis decreased by 60%. Medical adhesive-related skin injury decreased by 88%. Medical device related pressure injuries reduced by 11%. Healing time for existing PI improved by an average rate of 60%. Compliance with risk assessment documentation is increased with good rate. No significant increase rate was observed.

Conclusion: The institution's structured approach to pressure injury prevention & management demonstrated a significant reduction in incidence & improvement in healing. These findings underscore the importance of sustained multidisciplinary efforts, education & adherence to evidence-based practices in reducing the burden of pressure injuries.

Abbreviation: PI – Pressure Injury

Slashing DTN (door to needle time): a PA led protocol for accelerated stroke thrombolysis

Abstract ID: 29
Submitted: September 20, 2025
Author: Anna Sneha

Introduction: When it comes to acute ischemic stroke, every minute of door-to-needle (DTN) time is critical. Our objective was to significantly reduce this time by implementing a streamlined, PA-led protocol.

Methods: Our multidisciplinary team developed a protocol centered on rapid code stroke paging and prompt be fast (balance, eye, face, arm, speech and time) recognition. This approach emphasized crisp blood sugar and vitals monitoring alongside express NIHSS (National Institute of Stroke Score) and other scoring to facilitate prompt imaging and rapid decision-making.

Results: The protocol led to a dramatic DTN reduction, bringing the median time down from 120 minutes to a range of 45–55 minutes ($p < 0.001$). This was associated with a greater proportion of patients achieving a modified Rankin Scale (mRS) score of 0–2 at 90 days (55% vs. 45%, $p = 0.04$).

Conclusion: This PA-led protocol successfully leveraged a focused workflow to substantially reduce DTN time. The results demonstrate that a targeted approach to rapid recognition, scoring, and imaging can significantly improve patient outcomes and deserves consideration as a new standard of care.

"From policy to practice: evaluating the insights of the Physician Associates in Kerala on NCAHP Act"

Abstract ID: 28
Submitted: September 20, 2025
Author: Nayana Lakshmi

Background: Physician Associates have been serving India's healthcare system since more than two decades.We've been facing issues of recognition, regulation, and systematic career advancement. The passage of the NCAHP Act in 2021 was a landmark change, seeking to regulate allied health professionals and regularize their integration.

Aim: The aim of the objective is to evaluate the insights of Physician Associates in Kerala on NCAHP Act.

Objectives:
1. Measure awareness of the NCAHP Act among practicing PAs.
2. Determine its perceived effects on professional acceptance, career advancement, and workforce integration.
3. Determine prevalent challenges in licensure, compensation standardization, and role definition.

Methods: A cross-sectional descriptive survey was carried out among working PAs in Kerala. A formal, expert-validated questionnaire was sent through professional networks and interviews, which covered demographics, knowledge of NCAHP, perception of regulation, and career goals. Quantitative responses were analyzed using descriptive statistics, and thematic coding was used for qualitative feedback.

Results: Initial results show that >85% recognize the NCAHP Act, with 72% feeling it enhances professional recognition. Tangible benefits in career development or remuneration are reported by only 35%. The major identified challenges are the lack of a national licensing examination, restricted prescribing rights, and uneven deployment into public versus private healthcare systems. Notably, 60% of respondents expressed willingness to join government health services if formal recruitment pathways existed.

Conclusion: The NCAHP Act has caused hope regarding the future of PAs in India, but its real effect is still incomplete. Regulating by way of licensing exams, uniform salaries, and career ladders is imperative to optimize the contribution of the PA workforce. The current research identifies policy priorities for solidifying the role of PAs in India's changing healthcare context.

"Assessment of the safety and efficacy of Romiplostim in live donor liver transplant recipients – a prospective randomised study"

Abstract ID: 27
Submitted: September 20, 2025
Author: Gayathridevi M

Introduction: Following live donor liver transplantation (LDLT), thrombocytopenia commonly occurs, with very low platelet counts portending significant morbidity and normalisation of platelet counts foretelling good graft function. Romiplostim, a thrombopoietin receptor agonist used in hematological thrombocytopenic conditions, has not been studied in the context of LDLT. We aimed to evaluate The safety and efficacy of romiplostim in improving thrombocytopenia following LDLT.

Methods: LDLT recipients (> 18 years) who had a platelet count < 40,000/cmm within the first week following transplantation were block randomised using computer-generated sequences into either the study group (receiving Romiplostim 250 mcg subcutaneously every 3 days until platelet count reached 70,000/cmm) or the control group. The primary endpoint was platelet count normalisation time. Secondary endpoints included incidence of vascular thrombosis, number of platelet transfusions, liver parameters recovery trend, early allograft dysfunction, length of hospital stay, and cost comparison.

Results: Among 58 LDLT patients, 30 were categorized into the Romiplostim (n = 15) and control (n = 15) groups. The time to achieve a platelet count >70,000 was similar (7 vs. 7 days, $p = 0.6$), but platelet transfusions were significantly lower in the Romiplostim group (1.00 vs. 3.50, $p < 0.001$). Vascular thrombosis and EAD rates were identical (6.6%, $p > 0.9$). The Romiplostim group showed greater reductions in bilirubin (–3.58 vs. –1.24, $p = 0.008$), prothrombin time (–31 vs. –15, $p = 0.020$), and INR (–2.67 vs. –1.39, $p = 0.017$). They also had a shorter hospital stay (20 vs. 29 days, $p < 0.001$) and lower treatment costs (17,423 vs. 48,300, $p = 0.035$)

Conclusion: Romiplostim effectively reduced platelet transfusion requirements in LDLT patients without increasing the risk of vascular thrombosis or early allograft dysfunction. Additionally, it was associated with greater improvements in liver function parameters, a shorter hospital stay, and reduced treatment costs. These findings suggest that Romiplostim may be a valuable therapeutic option for optimising perioperative management in LDLT.

"Evaluating survival and risk of future decompensation after first variceal bleed in cirrhotic HCC patients without prior decompensation"

Abstract ID: 26
Submitted: September 20, 2025
Author: Gayathridevi M

Introduction: Hepatocellular carcinoma (HCC) is the most common primary liver malignancy and a leading cause of death in cirrhotic patients. Variceal bleeding (VB) is a life-threatening complication in cirrhosis with HCC. This study aimed to assess survival and future risk of decompensation following the first variceal bleeding episode in patients with HCC and cirrhosis without prior decompensation.

Materials and Methods: This prospective study was conducted over 12 months at a tertiary care institute in India, including 75 patients with cirrhosis and HCC from the Medical Gastroenterology Department. Patients were divided into groups based on survival status at 6 weeks and 1 year after the initial variceal bleeding.

Results: Mortality rates were 33.3% at 6 weeks and 68% at 1 year. No significant differences in age or gender were noted between the alive and deceased groups ($p > 0.05$). At 1 year, a higher proportion of deceased patients were at HCC stage C ($p = 0.001$), while no stage differences were observed at 6 weeks ($p = 0.065$). No significant differences were found in CLD stages or comorbidities ($p > 0.05$). Extrahepatic metastasis was more common in deceased patients at 6 weeks and 1 year ($p = 0.005$ and 0.002), and higher AFP levels were observed in deceased patients at 6 weeks ($p = 0.039$). Alive patients had more GOV2 and BRTO/PARTO findings ($p = 0.045$ and 0.037). Rebleeding within ≤ 4 weeks was more frequent in non-survivors at both intervals ($p = 0.003$ and 0.007).

Conclusion: Survival after first variceal bleeding in cirrhotic HCC patients is significantly affected by advanced HCC stage, portal vein tumor thrombosis, extrahepatic metastasis, and early rebleeding. Vigilant monitoring and timely interventions are essential to improve outcomes in this high-risk population.

Factors influencing outcomes following day-care breast surgeries being performed for breast cancer in a single centre in south India

Abstract ID: 25
Submitted: September 20, 2025
Author: Dr. Debashri

Introduction: Day care surgeries as a concept allows enhanced post-operative patient recovery and quick integration to normal activities. The aim is to provide while optimizing healthcare costs and resources.
In breast surgery, day-care procedures are not yet standard of care and most procedures are managed as in-patients due to a lack of structured outpatient follow up care, concerns about pain management and drain care.
In our centre, nearly all breast surgeries are performed as day care. In this study, we aim to best quality of care , identify and assess the factors influencing the outcomes of day-care breast surgeries.

Objective: To assess the patient and clinical factors influencing outcomes following day-care surgeries being performed for breast cancer in a single centre in south India.
Outcomes – identification of favourable and unfavourable factors for breast surgeries as day care surgeries based on clinical and patient-related outcomes.
Secondary – Need for re-admission post discharge – in view of complaints not manageable at home

Materials and Methods: It is a retrospective observational study. All patients who have undergone triple assessment and have been diagnosed to have breast carcinoma were identified between 2022–2024 at Chennai Breast Centre. Among them, all patients who underwent a mastectomy for breast cancer treatment between 2022–2024 at Chennai Breast Centre were included. Clinicopathological data was retrieved from electronic and manual records and analysed.

Results: There were 717 patients admitted at our centre between 2022–24. 504 surgeries were done for breast malignancies.
Of the 504 patients, 384 were discharged on the same day and 120 underwent a discharge on the next day.

Conclusion: Breast surgeries can be routinely performed as day care surgeries, especially those who have upfront surgery, with no or minimal comorbidities
Day care breast surgeries will need to be facilitated with adequate pre-operative preparation, anaesthetic techniques, outpatient postoperative care setup.

Advancing Physician Associate education in India through simulation-based learning: an evaluation of its effectiveness in clinical training

Abstract ID: 24
Submitted: September 20, 2025
Authors: Ebin Abraham and Silpha Susan John

Role of PA: Data collection and analysis

Background: Simulation-based learning (SBL) has emerged as a pivotal pedagogical tool in health professions education, known for enhancing clinical reasoning, procedural skills, and learner confidence in a risk-free environment. While widely adopted in medical and nursing curricula, its integration into Physician Associate (PA) education in India remains limited and largely undocumented.

Objective: To assess the satisfaction and perceived educational value of PA students who underwent structured simulation-based clinical training as part of their curriculum.

Methods: A descriptive cross-sectional study was conducted among 51 PA students (Second year = 43.1%, Third year = 29.4%, Internship = 27.5%) at the Amrita Clinical Skills Simulation Center, Kochi. Structured SBL sessions were implemented from January 2022 to January 2024. Data were collected through a 23-item Likert questionnaire administered via Google Forms between May and June 2025. Analysis was done using SPSS version 26.0 and Python. Descriptive statistics, Cronbach's alpha, and One-way ANOVA were used.

Results: The mean satisfaction score was 4.27 ± 0.55, indicating high satisfaction, while challenges scored 3.63 ± 0.48. Reliability was excellent for satisfaction ($\alpha = 0.91$) and acceptable for challenges ($\alpha = 0.67$). No significant difference in satisfaction was observed across academic years ($p = 0.91$).

Conclusion: The structured simulation-based learning initiative was well received by Physician Associate students and contributed positively to their clinical confidence, engagement, and overall learning experience. As one of the first comprehensive SBL implementations in Indian PA education, this study underscores its feasibility and effectiveness, offering a potential framework for wider curricular integration across similar programs nationally.

Long term outcomes of chronic kidney disease patients after isolated off pump coronary artery bypass grafting – a comparative study

Abstract ID: 23
Submitted: September 20, 2025
Author: Praveena Arun

Background: Renal dysfunction is independently associated with both short-term and long-term mortality after off pump coronary artery bypass grafting (OPCABG). The estimated glomerular filtration rate (eGFR) is a convenient and effective indicator of renal function. To overcome the limited evidence on long term outcomes in Indian patients with renal dysfunction, we aimed to compare the long term survival in patient with eGFR <60 ml/min and ≥ 60 ml/min after isolated OPCAB.

Methodology: Our study is retrospective – prospective cohort comparative study of patients who underwent isolated OPCAB between January 2016 and December 2024. We compared CKD patients (eGFR <60 ml/min) after OPCABG with patients with normal renal function (eGFR ≥ 60 ml/min). The eGFR was calculated using standard equation of Cockcroft-Gault formula. We excluded patients who underwent on pump CABG, concomitant valve surgeries and Redo surgeries. A Propensity score matching was applied to minimize baseline imbalances.

Results: Out of the 2627 patients who underwent OPCABG, 1071 (40.7%) patients with preoperative renal dysfunction were compared with patients with normal renal function. The mean age of the cohort was 61.7 ± 8.62 years. The two groups had comparable demographic variables. with an overall 10-year survival of 75.9%, patients with renal dysfunction had a significantly lower 10-year survival (66.2% vs. 90.1%; $p < 0.001$). 2.2% of patients with preoperative renal dysfunction required postoperative dialysis ($p < 0.001$).

Conclusion: Patients with renal dysfunction undergoing isolated OPCAB demonstrated significantly worse long term outcomes compared with those without preoperative renal impairment, underscoring renal dysfunction as a key determinant of prognosis after surgery.

Identifying gaps and opportunities in Physician Assistant education: a mixed-methods study from the Amrita PA program

Abstract ID: 22
Submitted: September 20, 2025
Authors: Ebin Abraham and Hamsaveni M

Role of PA: Data collection and analysis.

Background: Physician Assistants (PAs) are an emerging professional group in India, and alumni perspectives are vital to strengthening PA education. This study explored the experiences of alumni who graduated from the earlier specialty-based curriculum (2012–2020 batches) of the Amrita PA Program to identify strengths, gaps, and opportunities. Their continuous feedback informed major curriculum reforms: a shift to a generalised model from 2021, transition to an Outcome-Based Curriculum (OBC) from 2023, and implementation of the National Commission for Allied and Healthcare Professions(NCAHP)-aligned curriculum from the 2025 batch onward.

Methods: A mixed-methods approach was used. Quantitative data from 145 alumni were collected via an online questionnaire assessing demographics, employment, specialty distribution, career progression, satisfaction, and preparedness. Qualitative responses to open-ended questions were analysed thematically.

Results: Most respondents were female (73.7%) and aged 22–30 years (58.1%), employed in cardiology, neurology, and surgery. Nearly one-third reported promotions, with many pursuing higher studies or international roles. While career satisfaction was moderate (61.3%), alumni suggested strengthening generalist foundations, structured mentorship, hands-on training, and career guidance. Thematic analysis identified six key themes: curriculum evolution, mentorship, practical training, career guidance, professional identity, and alumni-led recommendations.

Conclusion: This study consolidated alumni feedback from the pre-2021 curriculum, validated the reforms initiated since 2021, and guided the transition to the NCAHP-aligned curriculum. Embedding alumni voices has helped the program evolve into a future-ready model for PA education in India.

Comparative evaluation of lubiprostone and prucalopride in chronic idiopathic constipation: an open-label randomized controlled trial

Abstract ID: 20
Submitted: September 20, 2025
Author: Anju Gopinath

Background/Introduction: Chronic idiopathic constipation (CIC) affects 10–17% of the global population, significantly impairing quality of life. Lubiprostone (chloride channel activator) and prucalopride (selective 5-HT4 agonist) are approved for CIC, but direct comparative data in the Indian population are lacking.

Methods: In this open-label randomized controlled trial (CTRI/2025/03/082417), 30 adults (18–80 years, Rome IV criteria) were randomized 1:1 to receive lubiprostone 24 mcg daily or prucalopride 2 mg daily for three weeks. The primary endpoint was the proportion of patients achieving >3 spontaneous bowel movements (SBMs) per week. Secondary endpoints included changes in Bristol Stool Form Scale (BSFS), Patient Assessment of Constipation Symptoms (PAC-SYM) scores, and adverse drug reactions (ADRs).

Results: Baseline demographics were comparable except for gender (prucalopride: 73% male; lubiprostone: 33% male). At week 1, more patients on lubiprostone achieved >3 SBMs (46.7% vs. 13.3%, $p = 0.046$). By week 3, both groups showed similar improvement (73.3%). PAC-SYM and BSFS scores improved significantly in both groups, with no between-group difference. Subgroup analysis revealed greater improvement in females, particularly with prucalopride ($p < 0.01$). ADRs occurred in 67% of patients in both groups, all mild to moderate.

Conclusion: Both lubiprostone and prucalopride are effective and safe for short-term management of CIC. Lubiprostone provides faster relief, while prucalopride offers sustained benefits, especially in females. This first Indian head-to-head trial highlights the potential for gender-tailored therapy in CIC management.

"Rethinking strategies for ensuring adequate distal limb perfusion in patients undergoing femoral artery cannulation for VA-ECMO support"

Abstract ID: 19
Submitted: September 19, 2025
Authors: Dr. Ashwini Kumar Pasarad, Dr. Madhusudan, and Mr. Channabasava

Role of PA: The PA contributed to data collection, intra-operative assistance, post-operative management, and preparation of the abstract.

Introduction: Venoarterial extracorporeal membrane oxygenation (VA-ECMO) via femoral artery cannulation provides rapid circulatory support in refractory cardiogenic shock and cardiac arrest. However, it carries a significant risk of ipsilateral limb ischemia. Distal perfusion catheters (DPCs) are widely used, but their optimal application and monitoring remain uncertain.

Objective: To evaluate outcomes of distal perfusion strategies in femoral VA-ECMO based on single-center experience.

Methods: A prospective observational study was performed on 20 patients undergoing femoral VA-ECMO with adjunctive DPC placement between [insert study period]. Data on demographics, cannulation technique, catheter use, monitoring modalities, and outcomes were analyzed. Primary endpoints included limb ischemia, vascular complications, limb salvage, and survival.

Results:
DPC placement success: 100% Limb ischemia: 15%
Further intervention required: 10%
DPC-related complications (bleeding/infection): 10%
Adjunctive monitoring detected early perfusion compromise: 20%
Major limb amputation: 0%
Limb salvage rate: 100% Hospital survival: 65%

Conclusion: Early DPC placement combined with proactive monitoring significantly reduces ischemic complications in femoral VA-ECMO. Adjunctive modalities such as near-infrared spectroscopy and ultrasound enable timely intervention and ensure complete limb salvage. Standardized protocols integrating individualized distal perfusion strategies are essential, and multi-center studies are warranted to validate best practices.

Bleeding risk of dual antiplatelet therapy with ticagrelor versus clopidogrel after isolated off-pump coronary artery bypass grafting: a comparative study

Abstract ID: 18
Submitted: September 19, 2025
Author: Varshini Subhash

Objective: Dual antiplatelet therapy (DAPT) with ticagrelor and aspirin demonstrated superior saphenous vein graft patency following off-pump coronary artery bypass grafting (OPCABG) compared with clopidogrel and aspirin. However, its associated bleeding risk remains uncertain. This study aims to evaluate the incidence of bleeding complications with ticagrelor- versus clopidogrel-based DAPT in Indian patients undergoing isolated OPCABG.

Methods: We conducted a retrospective comparative analysis comparing patients who underwent isolated OPCABG from May 2020 to August 2024 and were prescribed Aspirin and Ticagrelor (Ticagrelor group) postoperatively with those patients who were operated between January 2016 to December 2017 who were on Aspirin and Clopidogrel (Clopidogrel group). Patients undergoing on-pump CABG, concomitant valve procedures or requiring postoperative oral anticoagulation for atrial fibrillation or coronary endarterectomy were excluded. Major bleeding events were defined as reoperation for bleeding, pericardial or pleural effusion, gastrointestinal bleeding, cerebral hemorrhage, or bleeding necessitating hospitalization. Propensity score matching was applied to minimize baseline imbalances, and multivariable logistic regression was performed to determine the independent effect of DAPT strategy on 30-day mortality.

Results: Of the 1424 patients who were included, the ticagrelor group comprised 764 (53.6%) patients. The mean age of the study population was 61.6 ± 8.51years. Both the groups had comparable demographic variables. Patients in the ticagrelor group had a significantly higher incidence of major bleeding events (11.9 % vs. 6.6 %) including pericardial effusion ($p = 0.043$), cerebral hemorrhage ($p < 0.065$), gastrointestinal bleeding ($p = 0.016$) and a higher rate of hospital readmissions ($p < 0.01$). A propensity matched analysis may modify these results. Major adverse cardiac and cerebrovascular events were also significant higher in the ticagrelor group ($p < 0.001$).

Conclusion: In patients undergoing isolated OPCABG, ticagrelor-based DAPT was associated with an increased risk of major bleeding and hospital readmissions compared with clopidogrel-based DAPT. These findings highlight the need for personalised risk-benefit assessment prior to routine adoption of ticagrelor in this setting.

Evaluating correlation between GCS score and CT brain findings in patients with mildhead injury – the role of physicianassistants in triage

Abstract ID: 17
Submitted: September 18, 2025
Author: Sivaranjani. M

Introduction: Mild head injury (MHI), defined by a Glasgow Coma Scale (GCS) score of 13–15, is the most frequently encountered traumatic brain injury in emergency practice. While many patients remain neurologically stable, a notable proportion may harbor intracranial lesions requiring timely intervention. Establishing the correlation between GCS and computed tomography (CT) findings can guide selective imaging, improve triage, and prevent missed pathology. For Physician Assistants, this relationship is particularly valuable in busy emergency departments, supporting accurate decision-making and prioritization of care.

Objective: To evaluate the correlation between GCS score and CT brain findings in patients with mild head injury.

Methods: A prospective observational study was conducted on 50 patients with MHI (GCS 13–15) presenting to a tertiary care emergency department. All patients underwent detailed neurological assessment followed by non-contrast CT brain. CT findings were classified into normal, skull fractures, extra-axial hemorrhages [epidural hematoma (EDH), subdural hematoma (SDH), subarachnoid hemorrhage (SAH)], and cerebral contusions. Statistical correlation between GCS and CT abnormalities was analyzed.

Results: CT abnormalities were observed in 25 (50%) patients. The most common lesions were cerebral contusions (36%), followed by SDH (28%) and EDH (20%). Patients with GCS 13–14 demonstrated a higher rate of CT abnormalities (72%) compared to those with GCS 15 (36%) ($p < 0.05$).

Conclusion: A significant proportion of MHI patients reveal intracranial abnormalities on CT brain. Lower GCS scores within the mild range correlate with higher risk of pathology, supporting selective CT imaging. Physician Assistants play a pivotal role in identifying high-risk patients, optimizing triage, and ensuring efficient use of imaging resources in emergency care.

Keywords: Mild head injury, Glasgow Coma Scale, CT brain, traumatic brain injury

Radiological–pathological concordance in fibroepithelial lesions undergoing core needle biopsy – a retrospective study

Abstract ID: 15
Submitted: September 18, 2025
Author: Roshini H

Role of PAs: Coordinate radiology–pathology workflow, including meetings and referrals. Assist in biopsy procedures, imaging protocols, and accurate documentation. Facilitate patient counselling, follow-up, and continuity of care.

Background: Fibroepithelial lesions (FELs) of the breast, encompassing fibroadenomas and phyllodes tumours, remain a diagnostic challenge due to overlapping radiological and histological features. While fibroadenomas are usually managed conservatively, phyllodes tumours require timely surgical excision given their malignant potential. Reliance on core needle biopsy (CNB) alone may lead to misclassification; therefore, radiological–pathological correlation is crucial in optimizing patient outcomes.

Methods: The present analysis is limited to 70 cases, as data collection is ongoing. These preliminary findings provide valuable insights and will be supplemented by additional cases in the final thesis to strengthen the overall conclusions.
This retrospective study included 70 female patients (≥18 years) with FELs diagnosed on CNB between June 2020 and June 2025 at Sri Ramachandra Institute of Higher Education and Research. Radiological features such as BI-RADS classification, lesion size, margins, and internal echotexture were evaluated and correlated with histopathology from excisional biopsies. Concordance was categorized as concordant, minor discordance, or major discordance. Statistical analysis included chi-square test and Spearman's correlation.

Results: A considerable proportion of CNB-diagnosed fibroadenomas were upgraded to phyllodes tumours post-excision, highlighting the limitations of CNB alone. Radiological predictors including lesion size >3 cm, lobulated or micro lobulated margins, and internal heterogeneity showed strong association with phyllodes tumours. High concordance was observed when radiological suspicion was integrated with histological features.

Conclusion: Radiological–pathological concordance significantly improves diagnostic accuracy in FELs and guides appropriate surgical intervention, reducing risks of both under- and overtreatment. Incorporating imaging predictors enhances early differentiation of phyllodes tumours.

Exploring quality of life and psychosocial impact using the Tamil wound-QoL tool in chronic wound patients

Abstract ID: 14
Submitted: September 18, 2025
Author: Atheeswari

Background: Chronic wounds affect more than just the skin – they can deeply disturb a patient's physical, emotional, social, and financial well-being. The Wound-QoL questionnaire is an established tool used globally to assess health-related quality of life (HRQOL) in wound care. A Tamil version is available, but there is limited data on how it performs among Tamil-speaking patients with chronic wounds, especially those with diabetic foot ulcers who experience high psychological and economic stress.

Aim: To evaluate the validity, reliability, and practical usefulness of the Tamil Wound-QoL questionnaire in assessing physical and psychosocial impact in patients with chronic wounds.

Methods: An observational study was conducted at Saveetha Medical College and Hospital. Fifty adult patients with chronic wounds completed the Tamil Wound-QoL along with the EQ-5D-3L and Numerical Pain Rating Scale (NPRS). Psychometric testing included internal consistency (Cronbach's alpha), test-retest reliability (ICC), and concurrent validity (correlation with pain and HRQoL scores). Data analysis was done using SPSS v25.

Results: The Tamil Wound-QoL showed excellent internal consistency (Cronbach's alpha = 0.86) and strong test-retest reliability (ICC = 0.90). It also showed moderate and significant correlations with NPRS and EQ-5D ($p < 0.001$), confirming concurrent validity. Patients openly expressed emotional, social, and financial distress during the assessment, demonstrating the questionnaire's ability to capture deep psychosocial impact.

Conclusion: The Tamil version of the Wound-QoL is a valid and reliable tool for assessing not just physical symptoms but also the emotional and social struggles of chronic wound patients. It is especially valuable in diabetic foot ulcer cases, which are common in South India. This tool can support better counseling, targeted treatment, and holistic care planning in real clinical settings.

Radiologic-pathologic correlation of breast micro-calcifications with stereotactic biopsy: enhancing the Physician Associates role in triage and counselling

Abstract ID: 13
Submitted: September 18, 2025
Author: K. Radhikaa

Background: Breast micro-calcifications could be an early sign of malignancy warranting a stereotactic biopsy. Stereotactic biopsy is performed under mammographic guidance for suspicious calcifications using a vacuum assisted system, while histology provides the definitive diagnosis, Physician Associates (PA's) who understand these correlations can play a vital role in triage, coordination, and patient counselling.

Objective: To evaluate relationship between radiological morphology, distribution of breast micro-calcifications and stereotactic biopsy outcomes over six years and to highlight how this knowledge enhances the PA's role in patient care.

Methods: We retrospectively reviewed patients who underwent stereotactic-guided biopsy for suspicious breast micro-calcifications between October 2019-June 2025. Calcifications. were categorized by morphology (pleomorphic, fine linear, amorphous, coarse, punctate) and distribution (clustered, segmental, regional, diffuse). Histopathology results were classified as benign, atypia, or malignant.

Results: A total of 117 patients were included, most frequent morphologies were amorphous (47.6%) and pleomorphic (32.3%), followed by punctate (11.3%). Fine linear and coarse heterogeneous calcifications were less common (1.6% each).
Radiologic-pathologic correlation showed pleomorphic calcifications carried the highest malignant potential, with 52.5% yielding malignancy. Amorphous calcifications were predominantly benign (62.7%), though some demonstrated atypia/malignancy. Punctate calcifications were largely benign or intermediate. Linear calcifications, though rare, were associated with atypia or malignancy, while all coarse heterogeneous calcifications were benign. These results are consistent with existing literature, reinforcing established associations between calcification morphology and underlying pathology.

Conclusion: Recognizing the predictive value of calcification morphology enables PA's to anticipate benign versus malignant outcomes and improve triage for stereotactic biopsy, ultrasound-guided biopsy or follow-up imaging. Awareness of stereotactic biopsy as minimally invasive alternative to surgical excision allows PAs to counsel patients more effectively, reduce anxiety, and enhance compliance. Integrating this knowledge strengthens the PA's contribution in recall, post-biopsy discussions and pre-surgical counselling, ultimately improving workflow efficiency and patient centered comprehensive breast care.

Impact of a Physician Associate (PA) educator on student outcomes: a comparative study

Abstract ID: 12
Submitted: September 17, 2025
Author: Sayani Sarkar

Background: The role of PA educators in PA programs is underexplored, in India where structured clinical exposure is limited. The integration of dedicated PA educators—faculty with academic and clinical training in the PA profession—offers the potential to bridge these gaps by providing focused mentorship, skill-based teaching, and professional role modelling. Despite this, limited empirical evidence exists on how PA educators directly impact student learning and professional outcomes. This study evaluates the role of PA educators in shaping clinical competence, confidence, and employability among PA students in India.

Methods: A retrospective cohort study was conducted among 100 PA students and are divided into two groups: Group 1: before the appointment of PA educators ($n = 50$) i.e. before 2023 and Group 2: after ($n = 50$) 2023. Student outcomes were measured using academic performance, self-reported clinical confidence and mentorship satisfaction.

Results: Students trained under PA educators performed significantly better in Academic performance: 38 students (76%) in the PA educator group achieved distinction-level scores compared to 21 students (42%) in the non-educator group ($p < 0.001$).
Clinical confidence: 41 students (82%) with PA educators reported high confidence versus 27 students (54%) without PA educators ($p < 0.001$).
Mentorship satisfaction: 44 students (88%) in the PA educator group expressed satisfaction, compared to 23 students (46%) in the non-educator group ($p < 0.001$) Additionally, interview preparedness was notably higher in the PA educator group.

Conclusion: The presence of PA educators substantially improves academic performance, clinical competence, and employability of PA students. These findings underscore the essential role of PA educators in strengthening the PA education system and ensuring better professional outcomes.

Correlation of aspartate aminotransferase to platelet ratio index with child-pugh, model for end stage liver disease, and model for end stage liver disease-sodium scores among patients with decompensated chronic liver disease

Abstract ID: 10
Submitted: September 17, 2025
Author: Sujitha P

Role of PAs:
Documenting clinical parameters, systematically identifying hepatic complications, and ensuring accurate bedside assessments, which are essential for correctly calculating APRI, Child-Pugh, MELD, and MELD-Na scores.

Background: Decompensated chronic liver disease (DCLD) involves advanced dysfunction with complications and poor survival. Prognostic scores (CTP, MELD, MELD-Na) are widely used but limited. The non-invasive APRI reflects fibrosis and severity, potentially correlating with established scores and aiding prognostication.

Methods: This prospective study, approved by the Institutional Ethics Committee (Ref: CSP/25/AUG/165/372), enrolled patients with decompensated chronic liver disease. After consent, demographic, clinical, and laboratory data were collected in a structured proforma and analyzed using SPSS v21.

Results: In this DCLD cohort, APRI correlated significantly with Child-Pugh ($r = 0.504$, $p = 0.008$), but not with MELD or MELD-Na. APRI aligned more with hepatic dysfunction and portal-hypertensive sequelae than with MELD-based mortality constructs. Among complications, only variceal bleeding correlated with APRI ($p = 0.041$), paralleling Child-Pugh. Taken together, these findings support the role of APRI as an adjunct marker that tracks global hepatic decompensation captured by Child-Pugh, but does not substitute for MELD or MELD-Na in prognostication and listing prioritization. Clinically, APRI may be useful for bedside risk contextualization in DCLD. Key limitations include modest sample size, multiple comparisons without adjustment, potential etiologic heterogeneity, and cross-sectional assessment; future studies with adequate power, etiology-stratified, and prospective design to test whether APRI adds incremental prognostic value beyond MELD/MELD-Na are proposed to be carried out as an extension of the present pilot study.

Conclusion: APRI correlates with Child-Pugh but not MELD/MELD-Na, and significantly with variceal bleeding. Its simplicity and non-invasive nature support its use as a supportive risk stratification tool in resource-limited settings.
The present findings represent preliminary results from my thesis work, which will be expanded with a larger sample size as recruitment progresses.

The impact of Physician Associate–led counseling on patient education & lifestyle changes in cardiac surgery patients

Abstract ID: 9
Submitted: September 16, 2025
Author: Pratyush Chakraborty

Background: Recovering successfully after cardiac surgery goes beyond just what happens in the operating room. It heavily relies on sticking to medications, making lifestyle changes, and preventing further issues. When patients don't fully grasp these elements, it can lead to repeated hospital visits and negative outcomes. Physician Assistants (PAs) are in a great position to provide structured counseling that reinforces education and boosts compliance.
This study looked at how PA-led structured counseling affects adherence, lifestyle changes, and clinical outcomes for patients after cardiac surgery.

Methods: We conducted a prospective observational study involving 60 patients who had CABG at Fortis Hospitals in Kolkata from May to July 2025.

The patients were split into two groups

Group A (Intervention, n = 30): These patients received structured counseling sessions led by PAs before discharge, with follow-ups via phone every week. The counseling focused on medication adherence, exercise, diet, quitting smoking, wound care, and follow-up appointments.
Group B (Control, n = 30): This group only received the standard discharge instructions. We assessed the patients at one month and three months after discharge, looking at medication adherence, dietary control, lifestyle changes, knowledge retention, and readmissions.

Results

Diabetic Control: 86% in Group A compared to 57% in Group B ($p = 0.037$)
Medication adherence at 3 months: 88% in Group A vs. 60% in Group B ($p = 0.019$).
Regular exercise adoption: 76% in Group A vs. 40% in Group B ($p = 0.004$).
Dietary compliance (low-fat, low-salt diet): 84% in Group A vs. 48% in Group B ($p = 0.003$).
Smoking cessation (among smokers, n = 18): 70% in Group A vs. 33% in Group B.
Readmission within 3 months: 1 patient (4%) in Group A vs. 4 patients (14%) in Group B.

Conclusion: For post-CABG patients, a systematic counseling program run by PAs has shown notable gains in patient understanding, medication adherence, dietary and exercise compliance, and smoking cessation. This emphasizes how important PAs are to post-CABG patient education to promote improved recovery and long-term health.

Assessment of risk factors of stone formation

Abstract ID: 8
Submitted: September 16, 2025
Author: A. Shenbagavalli

Introduction: Urolithiasis is a recurrent disorder with major morbidity and economic burden. Stone formation is largely influenced by lifestyle, diet, hydration, and systemic conditions rather than electrolyte imbalance alone. Early risk assessment and intervention are vital. Physician Associates (PAs) play a key role by performing structured evaluations, guiding metabolic work-up, counseling on diet and hydration, and ensuring follow-up, thereby improving outcomes.

Methods: This prospective observational study was conducted over 1 year in SRIHER with 80 patients (50 males, 30 females). Data on demographics, comorbidities (diabetes, hypertension, cardiac disease), and lifestyle factors (diet, salt intake, fluid use, exercise, alcohol) were collected. Physician Associates conducted detailed interviews, recorded comorbidities, lab values, and maintained accurate clinical records. Data were analyzed to identify associations with stone formation.

Results: Mean patient height was 164 cm and weight 93 kg; majority were from Tamil Nadu (61/80). Major risk factors were non-vegetarian diet (69%), high salt intake (56%), low fluid intake (47%), and alcohol use (31%). Comorbidities were common: diabetes (49), hypertension (36), family history (35). Mean serum sodium was 138 mmol/L and chloride 102 mmol/L. Lifestyle and systemic conditions showed strong correlation with stone formation. PAs' structured documentation was essential in identifying these risk patterns.

Conclusion: Stone formation is primarily influenced by lifestyle, diet, hydration, and comorbidities. Preventive strategies focusing on nutrition, fluid intake, and comorbidity management are essential. Physician Associates, through comprehensive evaluation, education, and consistent follow-up, serve as key drivers in reducing recurrence, enhancing quality of life, and advancing urological outcomes, underscoring their pivotal role in bridging clinical care and preventive health.

Efficacy of dual antiemetic prophylaxis in patients receiving high-dose carboplatin chemotherapy (AUC ≥ 4)

Abstract ID: 7
Submitted: September 16, 2025
Author: Roshith. R

Background: Chemotherapy-induced nausea and vomiting (CINV) remains one of the most distressing toxicities of cytotoxic therapy. Current guidelines recommend triple antiemetic prophylaxis for carboplatin at AUC ≥4, but in our institution, dual prophylaxis was routinely used with seemingly good outcomes.

Aim: To evaluate the rate of complete control of CINV during acute (0–24h) and delayed (>24h–7 days) with dual antiemetic prophylaxis (5-HT3 receptor antagonist + dexamethasone) in patients receiving carboplatin-based regimens (AUC≥4).

Methods: This prospective observational study was conducted at the Department of Medical Oncology, Amrita Institute of Medical Sciences, Kochi. Eighty patients with gynecological, thoracic (lung), breast, and other solid tumors scheduled to receive carboplatin-based chemotherapy (AUC 5–6) were enrolled. The majority of patients had gynecological malignancies. Combination regimens included carboplatin with paclitaxel, pemetrexed, or gemcitabine. Most patients received paclitaxel. All patients initially received dual prophylaxis with ondansetron or palonosetron plus dexamethasone. CINV was assessed using the MASCC Antiemesis Tool (MAT).

Results: The study included 62 females (77.5%) and 18 males, with a mean age of 58.4 years. Acute-phase control (first 24h) was achieved in 100% of patients. In the delayed phase, 92.5% (74/80) achieved complete response (CR: no nausea, no vomiting, no rescue medication), while 7.5% (6/80) developed delayed vomiting. All six were female; four had known high-risk factors (younger age, motion sickness, pregnancy-related hyperemesis,or alcohol intake). These patients required escalation to triple prophylaxis with aprepitant from cycle 2, after which CR was achieved.

Conclusion: Dual antiemetic prophylaxis provided excellent control (92.5% overall CR, 100% acute CR) in patients receiving high-dose carboplatin (AUC≥4). Only a minority of high-risk patients (7.5%) required escalation. Our findings suggest that routine triple prophylaxis may not be necessary for all patients in the Indian setting; instead, escalation can be reserved for those with risk factors or inadequate response.

Open label randomized trial of role of aspirin in mitigating acute cellular rejection following living donor liver transplantation

Abstract ID: 6
Submitted: September 14, 2025
Authors: Bhanootej Bathala, Bhanootej Bathala, Mrunal Awalekar, Guhan V, Madhu Sreenivasan D, Shweta Mallick, Krishnanunni Nair, Christi TV, Binoj ST, Unnikrishnan G, Dinesh B, Sudheer OV, and Sudhindran S

Background and Aims: Acute cellular rejection (ACR) following Living Donor Liver Transplantation (LDLT) occurs in approximately 15–40% of recipients with the current immunosuppressive regimens centred on Tacrolimus. Aspirin, in addition to its anti-platelet aggregatory actions, has immunomodulatory mechanisms, plausibly through inhibition of innate immunity. Use of aspirin following LDLT varies from unit to unit and data on its effects on vascular thrombosis or rejection is scarce. The rationale of our study is to scientifically evaluate the use of Aspirin following LDLT, and in particular, its effect in mitigating ACR.

Method: In this open label trial, patients undergoing LDLT between Jan 2023 and November 2024 were randomized into Aspirin (39) and No-aspirin (36) groups. Group 1 received 75 mg of Aspirin once daily starting 2 weeks after LDLT and continued for 6 months, whereas patients in the other group did not receive any anti-platelets. Exclusion criteria included – pretransplant portal/hepatic vein thrombus, retransplant, multi-organ transplants, platelet <50,000/uL at day 14, patients with previous history of treatment with aspirin and patients with vascular complications in the first 2 weeks post-transplant.
Primary objective was to analyze the effect of aspirin on acute cellular rejection following LDLT. Secondary objectives included rates of vascular thrombosis, complications specially bleeding, and hepatocellular carcinoma recurrence.

Results: In this analysis of 75 patients, the baseline parameters were similar in Aspirin (39) and No-aspirin (36) groups. There was a significantly lower rate of ACR in the aspirin group compared to the no-aspirin group.
There are no differences in the secondary objectives. On multivariate analysis, lack of aspirin use and CMV infection were deemed to be significant factors for the risk of ACR.

Conclusion: In this randomized trial, use of Aspirin at 75mg daily, starting 2 weeks following LDLT, appears to minimize the risk of ACR without increasing risk of bleeding.

Assessing Physician Associate task distribution in a tertiary hospital: a time-and-task analysis

Abstract ID: 5
Submitted: September 14, 2025
Author: Muhammed Suhail S

Role of the PA: The presenting author, a Physician Associate intern, is the PA-investigator who conceived and led this PA-focused study, designed the questionnaire, coordinated and conducted data collection among 50 PAs at PSG IMSR&H, performed data cleaning and quantitative analysis, and drafted the abstract.

Background/Introduction: Physician Associates (PAs) are a nascent mid-level provider cadre in India, trained to provide preventive, diagnostic, and therapeutic services across healthcare levels. The National Commission for Allied and Healthcare Professions defines a broad scope of practice for PAs, yet real-world deployment data remain limited. This study evaluated PA utilization in a tertiary hospital and examined the alignment of their task distribution with NCAHP recommendations.

Methods: In this PA-led study, a cross-sectional time-and-task survey was administered to all 50 PAs at PSG IMSR&H. A structured questionnaire, derived from NCAHP competency domains, captured frequency and time allocation across clinical, procedural, administrative, teaching, and research activities, as well as patient-facing versus non-patient-facing work. Data were analyzed using SPSS V26. Descriptive statistics summarized proportions, and specialty-wise differences were assessed using chi-square tests, with significance set at $p < 0.05$.

Results: Clinical care dominated PA activity, accounting for 62% of total work time. Procedural assistance and administrative duties contributed 17% and 15%, respectively, while teaching and research formed 6%. Overall, 71% of the time was patient-facing and 29% non-patient-facing. Specialty-wise variation was significant: surgical PAs spent more time on procedures (25% vs 12%, $\chi^2 = 6.4$, $p = 0.01$), while medical PAs reported higher administrative loads (24% vs 13%, $\chi^2 = 5.9$, $p = 0.02$). Teaching and research contributions were consistent across specialties.

Conclusion: PSG PAs perform clinical duties envisioned by NCAHP, validating their versatility as mid level providers. High patient facing engagement underscores value; measurable non clinical workload highlights optimization needs. Quantifying task distribution aligned with national standards strengthens evidence and offers a replicable model to advance NCAHP implementation and PA recognition.

Knowledge, perceptions and attitudes of Physician Associate students towards artificial intelligence (AI) integration in their curriculum: a cross-sectional study

Abstract ID: 4
Submitted: September 14, 2025
Author: Sandhya K N

Abstract

Background: Artificial intelligence (AI) is increasingly being integrated into healthcare, influencing diagnostics, decision-making, and clinical workflows. Health professionals, including Physician Assistants (PAs), require AI literacy to ensure safe and ethical applications. Evidence of PA students' perceptions of AI in healthcare and its integration into curricula in India is limited.

Methods: This cross-sectional descriptive study was conducted at the School of Allied Health Sciences in Amrita Vishwa Vidyapeetham, Kochi, India. All currently enrolled PA students from first to final year were eligible. Data were collected via a validated, self-administered Google Form adapted from Civaner et al., covering demographics, perceptions of AI, and curriculum preferences. Responses were analysed using SPSS v25; frequencies and percentages were calculated, and $p < 0.05$ indicated statistical significance.

Results: Seventy PA students participated (mean AI score = 16.73 ± 2.35; mean perception score = 18.09 ± 3.84). Most students expressed positive attitudes toward AI in healthcare, with a strong interest in integrating AI into the curriculum, particularly for clinical applications, addressing ethical issues, and utilising AI-based diagnostic tools. Ethical concerns included loss of humanistic aspects of care (totally/mostly agree: 43/70), erosion of trust (37/70), and confidentiality violations (34/70). A significant association was found between year of study and the belief that AI reduces the need for clinicians and employment opportunities ($p = 0.005$).

Conclusion: PA students demonstrate readiness for AI integration into their curriculum, with an emphasis on ethics and practical applications. Structured AI education that addresses both competencies and ethical frameworks is essential for preparing future clinicians for AI-enabled healthcare.

Clinical outcomes of transcatheter aortic valve replacement in bicuspid vs tricuspid aortic valve

Abstract ID: 3
Submitted: September 12, 2025
Author: Harini Anandan

Background and Aim: Transcatheter aortic valve replacement (TAVR) has demonstrated excellent safety and efficacy in patients with aortic valve (AV) stenosis; however, it poses challenges in patients with a bicuspid aortic valve (BAV), despite studies showing favorable outcomes. The study aims to compare the in-hospital and one-year clinical outcomes of TAVR between with (BAV) and tricuspid aortic valve patients.

Methods: In this single-center retrospective observational study, all patients who underwent TAVR from November 2017 to July 2025 for native AV stenosis at Madras Medical Mission were included. Their baseline, procedural characteristics, in-hospital, and one-year outcomes were compared. Valve-in-valve TAVR was excluded.

Results: Among 76 patients, 47 (61.8%) had tricuspid and 29 (38.2%) had a BAV stenosis. Sievers type 0, 1 (R-L), and I (R-N), bicuspid was 20.7%, 44.8% and 34.5% respectively. The mean age (75.04 ± 8.26 vs 71.96 ± 6.17, p-0.09). Median Euro II score (2.9% vs 5.2%, p-0.02), pre-peak (76.54 ± 25.20 vs 92.74 ± 29.93, p-0.01), and pre-mean AV gradient (47.82 ± 16.81 vs 60.43 ± 20.97, p-0.005) were higher in BAV. BAV patients had larger ascending aorta (31.54 ± 4.40 vs 36.99 ± 6.58 mm, p <0.001) and sino-tubular junction diameter (27.18 ± 4.19 vs 30.06 ± 4.86, p - 0.008) with high prevalence of aortic annular calcium (8.5% vs 31%,p-0.02). Balloon expandable valve was most preferred in BAV (44.7% vs 51.7%,p-0.63). Post-peak (17.74 ± 7.31 vs 21.21 ± 5.34, p-0.03) and post mean AV gradient (9.65 ± 4.17 vs 12 ± 3.02, p-0.01) were higher in BAV. No significant difference in incidence of moderate paravalvular leak (2.1% vs 3.4%, p-0.62). There was no in-hospital all-cause mortality at one-year (2.1% vs 6.9%,p-0.55) it was comparable.

Conclusion: TAVR in BAV shows favorable clinical outcomes, hence it is a safe and feasible option for BAV patients using current-generation transcatheter valves.

Prevalence of migraine in relation with depression: a cross-sectional study

Abstract ID: 2
Submitted: September 9, 2025
Author: Prakash J

Background: Migraine is a disabling neurological disorder commonly associated with depression, significantly affecting quality of life. Early recognition of this association is vital for holistic care. Physician Associates, with their patient-centered approach, contribute uniquely to bridging neurological and psychological management.

Methods: This cross-sectional study recruited 1050 migraine patients at ACS Medical College and Hospital, Chennai, via simple random sampling. Assessment tools included the Migraine Disability Assessment (MIDAS), Headache Impact Test (HIT), Hospital Anxiety and Depression Scale (HADS). Age, gender, disability severity, and comorbid depression were analyzed using descriptive statistics and chi-square tests. As a PA student investigator, I contributed to conceptualization, methodology, data collection, analysis, and writing.

Results: Most participants were females (64%) and aged 20–30 years (77%). Migraine-related disability was classified as little (42.3%), mild (12.6%), moderate (19.3%), and severe (25.8%). HADS revealed a high prevalence of depressive symptoms, significantly correlating with migraine severity. Female gender and younger age were strongly associated with both migraine and comorbid depression ($p < 0.05$).

Conclusion: This study demonstrates a significant link between migraine and depression, particularly in young women, underscoring the need for integrated neurological and psychological care. By highlighting the role of PAs in clinical research and patient care, the findings emphasize early screening and multidisciplinary interventions to reduce disease burden and improve quality of life.

Keywords: Migraine, Depression, Prevalence, Disability, Physician Associate

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