Shaping the Future of Health and Biomedical Informatics Education

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Why BMHI Education Matters

Growing demand for digital health competencies

- Increasing reliance on digital infrastructure in healthcare
- Persistent workforce shortages and gaps between graduate competencies and employers´needs

AI as a core competency

- Understanding machine learning and predictive analytics
- Safe and effective use of generative AI in daily practice

International framework for BMHI education

- IMIA recommendations revised in 2010 and 2023
- Three professional roles: **BMHI User, BMHI Generalist, BMHI Specialist**
- Six knowledge domains and international accrediation framework

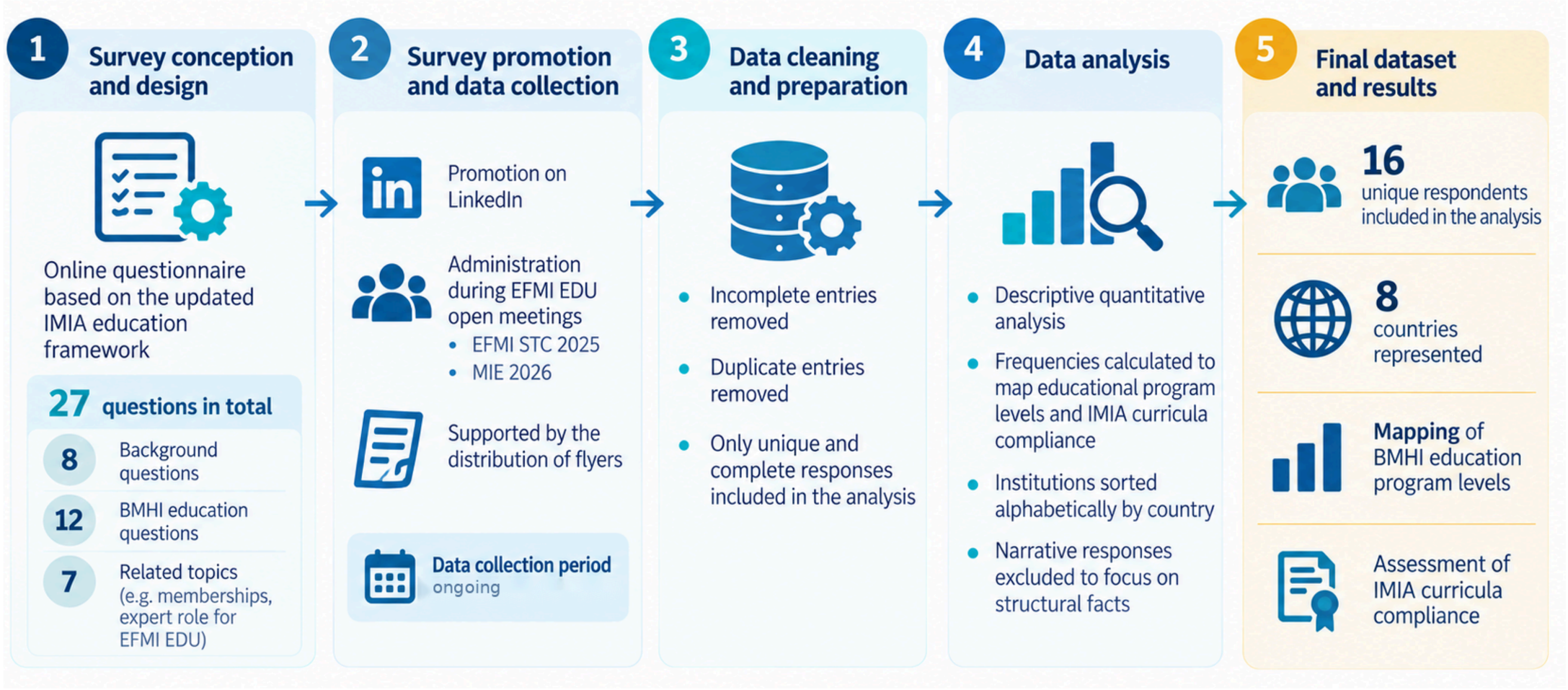
Study objective

- Examine the use of IMIA recommendations in education
- Map BMHI education structures across European countries through a pilot survey



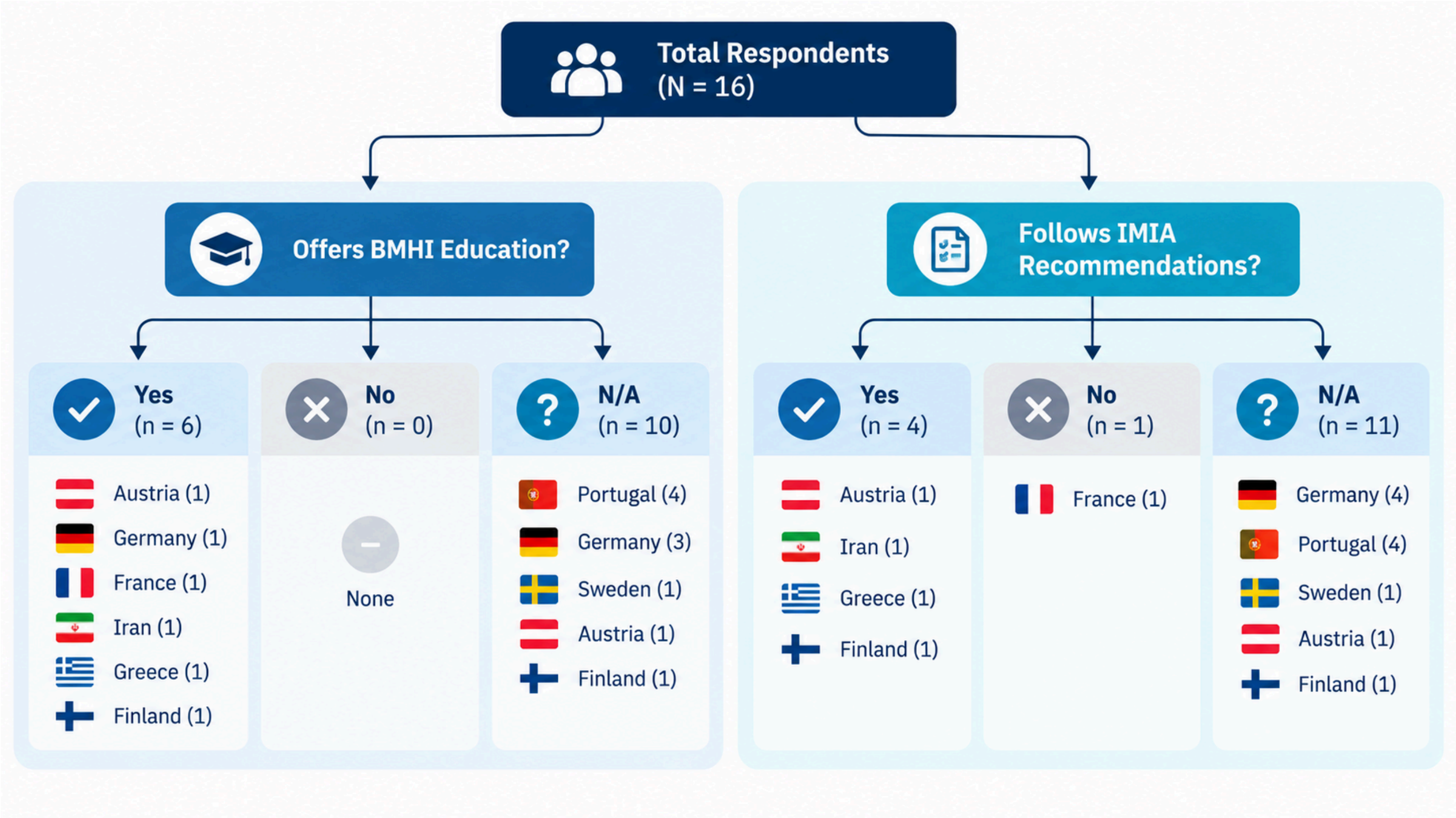
Pilot Survey: Methodological Approach

Mapping Biomedical and Health Informatics (BMHI) education structures across Europe



Pilot Survey Results

BMHI Education Provision and IMIA Recommendations Compliance (n=16)



AI Competency Focus Across IMIA Roles

Different learning outcomes and delivery approaches for a diverse healthcare workforce

IMIA role	AI competency focus	Illustrative outcomes	Typical delivery vehicle
BMHI user (e.g. practicing clinicians, nurses) 	**Generative AI and AI literacy; safe use**	• Understand **machine learning** and predictive analytics conceptually • Recognize **capabilities, limits, bias and hallucination** • Critically **appraise** AI outputs • Apply **prompt literacy** • Build **small, functional IT artefacts** with GenAI assistance • Know when to **defer** to **human judgement**	**Short-format CPD / micro-credentials (~ 50 h), online**
BMHI generalist (health informaticians) 	**Applied AI; integration and evaluation**	• **Select, configure** and **evaluate** AI/GenAI tools • Embed them in **clinical workflows** • **Interpret validation metrics** • **Monitor performance** • Translate **clinical needs** into **technical specifications**	**Postgraduate modules and advanced CPD**
BMHI specialist (developers, researchers) 	**AI system design and governance**	• **Develop, fine-tune and validate** models • Ensure **interoperability** (e.g. HL7 FHIR) of AI data pipelines • Conduct **bias auditing** and **clinical validation** • Apply **MLOps** and **algorithmic/regulatory governance** (EU AI Act, MDR)	**Master's / doctoral programmes and specialized training**

Shaping the Future of BMHI Education

From fragmented curricula to a resilient, AI ready healthcare workforce

THE CHALLENGE

Fragmented education
Competency gaps
Uneven use of IMIA recommendations

THE RESPONSE

Curriculum harmonisation
Global standards, local flexibility
Integration of AI competencies

THE WAY FORWARD

Role-specific AI competencies

BMHI User
Safe use & literacy

BMHI Generalist
Integration & evaluation

BMHI Specialist
Design & governance

Across educational patways
Degree programms + continuing professional development

KEY MASSAGE: One framework. Flexible pathways. Role-specific AI competencies.

EFMI WG EDU open-door Workshop

Date: 31.10.26

Time: 11:00-12:30

Room: Erechthion (Planetary)

Thank you for your attention!

References

1. Finnigan H, Mountford N. 25 years of electronic health record implementation processes: scoping review. J Med Internet Res. 2025 Mar 3;27:e60077, doi:10.2196/60077.
2. Hu H, Zhi Y, Ge H, Li J, Feng T, Wu X. An interdisciplinary course development in nursing informatics. CIN: Computers, Informatics, Nursing. 2026 May 11;00(00):e01544, doi:10.1097/CIN.0000000000001544.
3. Lee KH, Lee JH, Lee Y, Lee H, Lee JS, Jang HJ, et al. Impact of health informatics analyst education on job role, career transition, and skill development: survey study. JMIR Med Educ. 2024 Sep 25;10:e54427–e54427, doi:10.2196/54427.
4. Bichel-Findlay J, Koch S, Mantas J, Abdul SS, Al-Shorbaji N, Ammenwerth E, et al. Recommendations of the International Medical Informatics Association (IMIA) on education in biomedical and health informatics: second revision. Int J Med Inform. 2023 Feb 1;170:104908, doi:10.1016/j.ijmedinf.2022.104908.
5. Gazquez-Garcia J, Sánchez-Bocanegra CL, Sevillano JL. AI in the health sector: systematic review of key skills for future health professionals. JMIR Med Educ. 2025 Feb 5;11:e58161, doi:10.2196/58161.
6. IMIA. Recommendations of the International Medical Informatics Association (IMIA) on education in health and medical informatics. Methods Inf Med. 2000 Aug;39(3):267–77, doi:10.1055/s-0038-1634340.
7. Mantas J, Ammenwerth E, Demiris G, Hasman A, Haux R, Hersh W, et al. Recommendations of the International Medical Informatics Association (IMIA) on education in biomedical and health informatics. First revision. Methods Inf Med. 2010 Jan 7;49(2):105–20, doi:10.3414/ME5119.
8. Hasman A, Mantas J. IMIA accreditation of health informatics programs. Health Inform Res. 2013 Sep 13;19(3):154–61, doi:10.4258/hir.2013.19.3.154.
9. Saranto K, Kinnunen UM. Milestones and outcomes in health and human services informatics programs. In: Mantas J, editor. Achievements, milestones and challenges in biomedical and health informatics. Amsterdam: IOS Press; 2022. p. 77–92, doi:10.3233/SHTI220943.
10. Alzghaibi H, Jamal QMS, Almutairi S, Alotaibi RM, Alzughaibi S, Abdul SS, et al. Benchmarking IMIA recommendations for the health informatics undergraduate program in Saudi Arabia: a mixed methodology. BMC Med Educ. 2025 May 26;25(1):776, doi:10.1186/s12909-025-07260-1.
11. Baum A, Sosa F, Garcia G, Antonietti L, Otero P, Luna D. Empowering the digital health workforce in Latin America: perspectives from a health informatics master's program in Argentina. In: Househ MS, editor. Studies in health technology and informatics [Internet]. Amsterdam: IOS Press; 2025. p. 1392–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/40776085, doi:10.3233/SHTI251067. PMID: 40776085.
12. Were MC, Gong W, Balirwa P, Balugaba BE, Yeung A, Pierce L, et al. Comparative analysis of competency coverage within accredited master's in health informatics programs in the East African region. J Am Med Inform Assoc. 2021 Aug 13;28(9):1843–8, doi:10.1093/jamia/ocab075.
13. le Roux L, Bimerew M, Chipps J. Preparation of nursing students in nursing informatics competencies for the South African healthcare practice environment. BMC Nurs. 2024 Dec 18;23(1):923, doi:10.1186/s12912-024-02614-4.
14. Shobuzawa S, Endo Y, Yamanouchi K. Availability of nursing informatics education for master's programs in nursing administration at graduate schools of nursing in Japan. In: Honey M, editor. Stud health technol inform [Internet]. Amsterdam: IOS Press BV; 2021. p. 44–6. Available from: https://ebooks.iospress.nl/doi/10.3233/SHTI210660, doi:10.3233/SHTI210660.