Development and Validation of e-Portfolio for Undergraduate Medical Students in Pediatrics

Murchana Khound, Bipul Kumar Das, Jaya Shankar Kaushik

Department of Pediatrics, All India Institute of Medical Sciences, Guwahati, Assam, India

Correspondence to: Dr. Jaya Shankar Kaushik, Additional Professor and Head, Department of Pediatrics, All India Institute of Medical Sciences, Guwahati, Assam, India. *jayashankarkaushik@gmail.com*

PII: S097475591600660

ABSTRACT

Objective: To develop and validate e-portfolios for undergraduate medical students in the subject of Pediatrics.

Methods: A descriptive study was conducted among the second year medical undergraduate students. A core committee validated the E-portfolio created on the Google platform. The students were sensitized, trained on the platform, and encouraged to innovate by designing the e-portfolios themselves, and record their clinical experiences under the mentorship of faculty. The feedback was collected using a validated student and faculty questionnaire with closed and open ended questions. Satisfaction index was calculated based on the responses to closed ended questions using Likert scale. Open ended questions were analyzed using thematic approach.

Results: The study enrolled 34 students and 12 faculty members. Students recorded a high satisfaction index on their experience to be interesting (97%), well structured (85%), user-friendly (82%), and on being able to archive their clinical experiences (100%). Faculty members recorded a high satisfaction index (100%) in students' ability to record their clinical knowledge and reflect on their learning and innovation; all were motivated to use e-portfolios in their specialty. The thematic analysis highlighted student satisfaction with accessibility and organized record-keeping, while faculty praised e-portfolios for nurturing creativity and aiding memory retention. Concerns included resource intensiveness, design prioritization, and privacy issues.

Conclusion: E-portfolios are rated as promising tools to record comprehensive clinical experience in pediatric by undergraduate students and faculty. Addressing identified challenges will further optimize their adoption in medical curriculum, facilitating informed integration decisions.

Keywords: Curriculum, Logbook, Medical Education, Medical training, Reflection

INTRODUCTION

The portfolio is a comprehensive learning record that showcases a student's endeavors, development, accomplishments, and abilities. It aids students in identifying their learning goals, stimulates self-directed learning, and provides a platform to present their accomplishments [1]. These portfolios, centered on student learning, serve as a medium for learning and assessment, encouraging reflection on learning and bridging the theory-practice gap [2]. Competency-based medical education underscores the significance of maintaining a logbook and, optionally, a portfolio [2]. Evolving alongside medical education, portfolios have become invaluable tools in medical schools in the West [3]. While a student maintains a logbook to record the learning experiences, a portfolio also includes critical reflection on such learning experiences in the learner's own words. This self-reflection component forms the heart of the portfolio and differentiates it from a logbook [4].

In today's technology-driven world, electronic portfolios (e-portfolios) offer ecofriendly, globally accessible platforms, augmenting traditional assessment methods [5]. They also permit uploading various media, such as photos, videos, illustrations, sketches, blogs and hyperlinksThey serve as a dynamic repository of student's self-expression abilities.E-portfolios' historical development and increasing importance in higher

education have been highlighted, emphasizing their role in supporting student learning and assessment [6]. Additionally, implementing an e-portfolio system in the undergraduate medical education has shown positive feedback from students, supervisors, and new graduates, demonstrating its effectiveness during clinical placements [7]. E-portfolios also facilitate global sharing via social media, allowing students to showcase their skills and experiences, distinguishing themselves from traditional portfolios lacking electronic advantages [7].

However, despite the well-established benefits of e-portfolios, there needs to be more clarity regarding their structure, uniformity, and educational advantages [8,9]. Limited studies in India assess the implementation of portfolios for undergraduate medical students, particularly e-portfolios. Recognizing this research gap, the present study was conducted to develop and validate the use of e-portfolios for undergraduate medical students in Pediatrics, and explore the perceptions of students and faculty regarding its implementation .

METHODS

The present descriptive study was conducted, from March 2023 to February 2024, in a tertiary care institution among second year medical undergraduate students during their initial clinical exposure in Pediatrics. A core committee of faculty members was formed to discuss and develop an e-portfolio platform using Google sites. A pilot run was conducted with ten students to validate the platform.

Thereafter, the students were sensitized to the program through a demonstration session on creating and maintaining the undergraduate medical e-Portfolio. Three teams of four faculty member (one member from department of Pediatrics in each team) were assigned 10-12 students each. Students and their assigned faculty were oriented to the e-portfolio system, emphasizing goals and expectations. Students were encouraged to have regular meetings with their supervisors. A basic framework for the e-portfolio was provided to students, and students were encouraged to innovate and build up their site in their own style. Students reflected on their clinical experience at their convenience. Students shared the link of their individual e-portfolio with the assigned faculty member who served as mentors and facilitators in the process at the end of their clinical posting.

An expert-validated feedback questionnaire was administered to the students to obtain their feedback on their experience in developing the e-portfolio with a focus on its perceived educational value. The student's e-portfolio was shared with other department faculty members, and their feedback was recorded. The questionnaire utilized closed-ended responses using Likert scales, and the satisfaction index was calculated [10]. The satisfaction index was calculated from the formula (Number of satisfied students / Number of Survey Responses) x 100, where satisfied students are those selecting scores of 4 (satisfied) or 5 (very satisfied) on a five-point Likert scale, with the scores typically shown as a percentage. The open-ended questions posed included:"What are your views regarding the advantages of e-portfolios?", "What are your views regarding the demerits of e-portfolios in the MBBS curriculum?", "Would any changes benefit the other students who are making their e-portfolios?". The open-ended questions were analyzed using thematic analysis, which involved systematically coding responses to identify recurring patterns that were then organized into broad themes and sub-themes.

RESULTS

A total of 34 students out of 55 students who were approached, and 12 faculty members participated in the study. All students developed their e-portfolio webpage, snippets of the same has been provided in **Web Fig. 1**. The experiences of 34 students utilizing e-portfolios to document clinical experiences are summarized in **Table I**. Students recorded a high satisfaction index on their experience to be interesting (97%), well structured (85%), user-friendly (82%), and able to archive their clinical experiences (100%). Five students (14.7%) expressed difficulties in using the Google site platform. Ten students (29.4%) expressed interest in future e-portfolio use and recognized their potential for academic and clinical record-keeping.

Feedback from faculty overwhelmingly supported e-portfolio integration, highlighting its significant benefits. They expressed satisfaction with the quality and content of the portfolios. Faculty members recorded a high satisfaction index (100%) on students' ability to record the clinical experience and reflect on their learning and innovation. They acknowledged successful student engagement and considered e-portfolios superior for recording clinical experiences in future. (**Table II**) Faculty suggested improvements in validation processes, indicating a need for refining methods to assess and validate e-portfolios within the curriculum.

Students' perceptions regarding e-portfolios for clinical documentation reflected an intense satisfaction with their ease of accessibility, organized record-keeping, enhanced learning and recall, professionalism, tech-friendliness, facilitation of reflection and self-assessment, sharing capabilities, long-term documentation, content customization, and increased engagement with clinical cases. Despite these advantages, students voiced concerns about the time-consuming nature of portfolio creation, technical challenges faced by rural students, device limitations, and worries about privacy when incorporating patient-related information or images. **(Web Table I).**

On the other hand, faculty members highlighted the benefits of e-portfolios in nurturing creativity, engagement, accessibility, and reflection among students within clinical placements. They praised the platform's ability to promote creativity, sustain accessibility, document clinical learnings, and aid long-term memory retention. However, faculty also expressed concerns about resource intensiveness, potential design prioritization over content, the necessity for prior orientation, time management across multiple subjects, retention of negative experiences, privacy issues, data security, and unauthorized access. They emphasized the importance of training, privacy guidelines, content organization, software use, and seamless integration of e-portfolios in educational settings to maximize their effectiveness.

DISCUSSION

The present study explored the potential of the electronic format of portfolios for medical undergraduates in a tertiary medical institute in India. Both students and faculty expressed positive perceptions of e-portfolios in clinical education, lauding their structured framework while seeking enhancements in user-friendliness and guidance. The study brings out concerns regarding the technical hurdles, data privacy issues and feasibility of implementation of the same in the curriculum given the time-consuming nature and lack of familiarity of students and faculty with this educational tool. Nonetheless, students valued the e-portfolios for their accessibility and ability to foster reflective thinking, while the faculty appreciated the benefits of creativity and engagement.

A study from the United Kingdom highlighted the numerous benefits of e-portfolios, fostering workplace-based learning, durability, accessibility, professional growth, and colleague relationships, supporting students' transition to doctors [11]. Many of these advantages were reflected by the students. It has been shown that portfolio assessment in internship offers reliable information, proposing reduced tasks to enhance portfolio feasibility for both students and teachers in workplace learning assessment [12].

The thematic analysis highlights the benefits of e-portfoliosin terms of creativity, accessibility, reflection, and long-term memory but notes challenges in time consumption, technical issues, and privacy concerns, which are crucial for the successful implementation in clinical education. A study on e-portfolios for clinical dentistry trainees showed that recording learning activities and self-reflection enhanced critical analytical abilities. Curriculum evaluation, self-reflection assessment, mentorship, and faculty development were shown to be vital for successful e-portfolio implementation [13]. It emphasized the significance of both positive and negative experiences in practitioners' growth, with a more profound reflection on failures improving future performance [13]. In another study on first-year medical undergraduates using portfolio-based learning during a social service camp in India showed improvements in understanding rural issues, communication skills, and primary healthcare through self-directed learning [14].

E-portfolios in medical education offer benefits but present challenges. The time-intensive nature burdens students managing rigorous curricula, compounded by technical obstacles due to inadequate skills. Technical hurdles include device limitations which may hinder accessibility and requiring specific tools. Privacy concerns, particularly with patient-related data, demand resolution for ethical adherence. Favoring design over content risks compromising academic quality and requires careful handling. Our study findings underscore the necessity for future e-portfolio implementations to have user-friendly platforms, robust training, and clear guidelines.

The present study is one of the few studies from India which provides novel insights into the perspective of students and faculty members on developing and implementing e-portfolios for undergraduate students in pediatrics. However, one of the the limitations of this study is the small number of participants, which may limit the generalizability of our findings. Additionally, the predominance of closed-ended questions in the questionnaire could restrict the depth of insights gained. Future studies could benefit from a larger sample size and the inclusion of more open-ended questions to enable a deeper exploration of qualitative aspects.

This study demonstrates the positive reception and enthusiasm among students and faculty for integrating e-portfolios into the documentation of clinical experiences in undergraduate medical education. The findings underscore the benefits of e-portfolios in fostering creativity, engagement, accessibility, and reflective practices. However, challenges such as time consumption, technical issues, and privacy concerns must be addressed for effective implementation. The study contributes valuable insights for future endeavors in incorporating e-portfolios in medical education, emphasizing the importance of user-friendly platforms, training, and clear guidelines to overcome identified challenges.

Ethics clearance: AIIMS Institutional Ethics Committee No. AIIMS/IEC/M1/F7/2023, dated Feb 20, 2023.

WHAT THIS STUDY ADDS ?

- E-portfolios can be utilized to document clinical experiences during pediatric posting in medical undergraduates.
- Students and faculty members believe in the role of e-portfolios in enhancing clinical documentation, reflective learning, and student engagement and identifies key challenges to optimize educational outcomes.

REFERENCES

1. e-Portfolio. Center for Teaching & Learning. Teaching.berkeley.edu. Accessed February 2, 2024.Available from: https://teaching.berkeley.edu/resources/assessment-and-evaluation/design-assessment/e-portfolio

2. Santonja-Medina F, García-Sanz MP, Martínez-Martínez F, et al. Portfolio as a tool to evaluate clinical competencies of traumatology in medical students. Adv Med EducPract. 2016;7:57-61.

3. Medical student portfolios. Accessed February 2, 2024. Available from URL: https://www.aamc.org/system/files/c/2/490258-medicalstudentportfolios.pdf

4. Joshi M, Gupta P, Singh T. Portfolio-based learning and assessment. Indian Pediatr. 2015;52:231-5.

5. Online portfolio vs. traditional portfolio. Accessed February 2, 2024. Available from URL: https://www.portfoliobox.net/blog/online-portfolio-vs-traditionalportfolio

6. Farrell, O. 2020. From Portafoglio to Eportfolio: The Evolution of Portfolio in Higher Education. Journal of Interactive Media in Education, 2020:19,1-14.

7. Van Ostaeyen, S., Embo, M., Schellens, T. et al. Training to Support ePortfolio users during clinical placements: A scoping review. Med.Sci.Educ. 2022;32: 921-8.

8. Zubizarreta J. An overview of student learning portfolios. In: Zubizarreta J. The learning portfolio: Reflective practice for improving student learning. 1st Ed. Bolton, MA; 200;.3-19.

9. Tochel C, Haig A, Hesketh A, et al. The effectiveness of portfolios for post-graduate assessment and education: BEME Guide No 12. Med Teach. 2009;31:299-318.

10. Kaur D, Negi G, Jain A, et al. Structured feedback: A teaching and learning tool for the postgraduate medical students in transfusion medicine. Asian J Transfus Sci. 2023;17:13-20.

11. Belcher R, Jones A, Smith LJ, et al. Qualitative study of the impact of an authentic electronic portfolio in undergraduate medical education. BMC Med Educ. 2014;14:265.

12. Michels NRM, Driessen EW, Muijtjens AMM, et al. Portfolio assessment during medical internships: How to obtain a reliable and feasible assessment procedure? Educ Health (Abingdon). 2009;22:313.

13. Obayashi T, Oto T, Nagatani Y, et al. Dental trainees reflect more critically on negative experiences: Portfolio analysis using a pragmatic approach and a rubric in Japan. Med Educ. 2018;18:292-300.

14. Dongre AR, Deshmukh PR, Garg BS. Portfolio-based approach for teaching community medicine among medical undergraduates and assessment of their learning in a medical college in Rural India. South-East Asian J Med Edu. 2010;4:17.

Table I Student's Perception on E-Portfolio (*n* = 34)

Question	Score[a]	Satisfaction Index
The method for recording of clinical experience using e-portfolioswas interesting	4.35 (0.65)	97%
The method for the using Google site for creating e-portfolio was easy to operate	3.91 (0.90)	70%
The framework of e-portfolio was well structured	4.09 (0.71)	85%
The monitoring faculty was well acquainted with the e-portfolio	4.41 (0.70)	89%
Guidance about how to create the e-portfolio was well explained to me by the monitoring faculties.	3.79 (1.17)	70%
Feedback about improvement of my e-portfolio was properly given to me by the monitoring faculties	4.26 (0.95)	85%
I was more interested in class because I had to record my reflections in e-portfolio	3.74 (0.93)	64%
I found the digital way of recording experience user friendly	4.06 (0.74)	82%
The time allotted for creating the e-portfolio was sufficient	3.97 (0.76)	76%
I will be able to use e-portfolio for maintaining record of clinical activities in future	4.03 (0.83)	85%
I want to reflect on my experience thorough e-portfolio in other subjects as well	3.91 (0.81)	82%
E-portfolio must be made a part of clinical learning in the curriculum	4.03 (0.79)	79%

[a]*Scored using Likert scale, expressed as mean (SD)*
1: Strongly Disagree, 2: Disagree; 3: Neutral; 4: Agree; 5: Strongly agree

Table II Faculty's Perception on the use of E-Portfolio for Medical Undergraduates (*n* = 34)
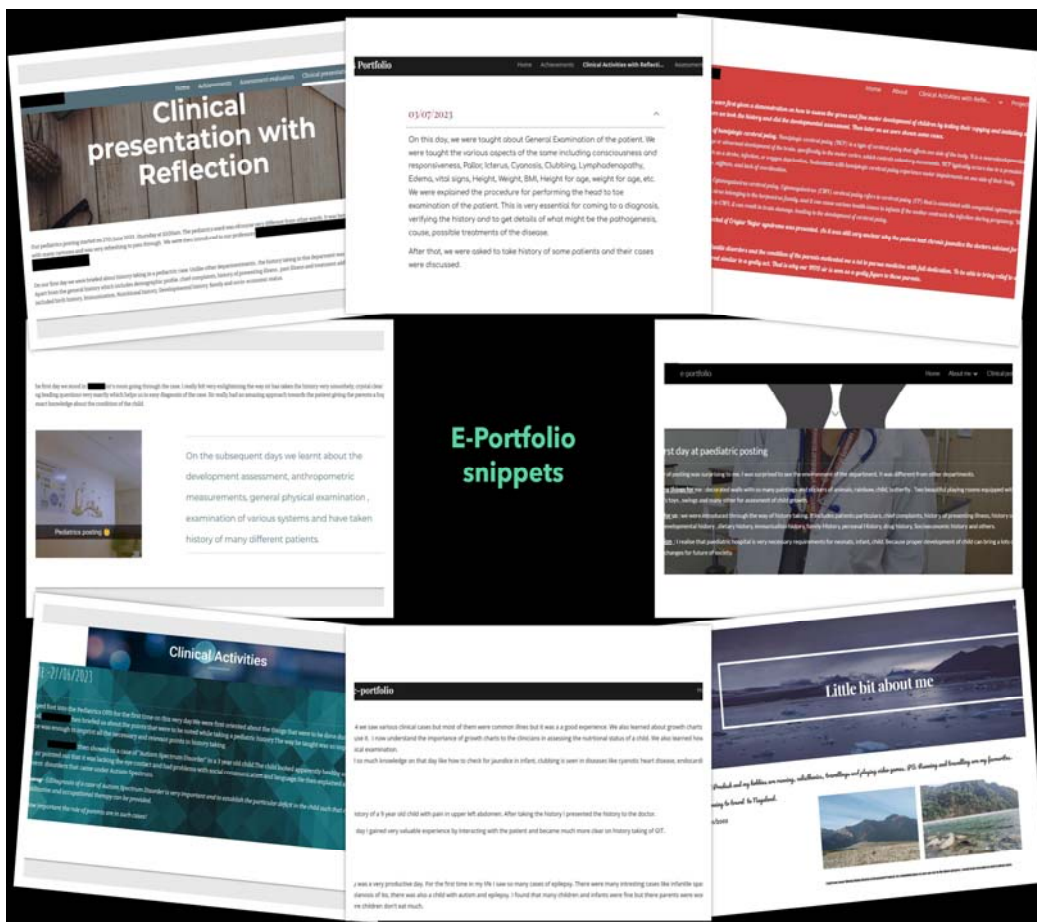
Question	Score[a]	Satisfaction Index
E-portfolio as a part of students curriculum should be encouraged	4.42 (0.51)	100%
The quality of the e-portfolio was satisfactory	4.33 (0.65)	91%
The content of the e-portfolio was relevant	4.17 (0.39)	100%
The students could successfully make a e-portfolio	4.5 (0.52)	100%
The students could write their reflection in the e-portfolio	4.67 (0.49)	100%
E-portfolio is a better way to record clinical experience than logbook	4.17 (0.83)	73%
Students used their own innovation in making their e-portfolio.	4.75 (0.86)	100%
E-portfolio can be used in MBBS curriculum	4.33 (0.49)	100%
My overall experience with validating e-portfolio was satisfactory	3.83 (0.58)	73%
I am motivated to use e-portfolio in my students in future	4.25 (0.45)	100%

[a]*Scored using Likert scale, expressed as mean (SD)*
1: Strongly Disagree, 2: Disagree; 3: Neutral; 4: Agree; 5: Strongly agree

Web Table I Student's Reflections on Merits and Demerits of E-Portfolio

Student's illustrative quotes (few) on merits of E portofio	Emerged theme
"Easy to access from anywhere and anytime" "I can keep record and review my data anytime"	Ease of use and accessibility
"Maintaining record of clinical activities for future" "Can systematically arrange all my entries at a single place"	Organized record keeping
"Helps us recall the topics we have learnt throughout the specific time frame" "Better recall of clinical scenarios"	Enhanced learning and recall
"Gives a sense of professionalism in attending clinical postings,"	Professionalism and skill development
"We become more tech-friendly by learning this"	Digital transformation and tech-friendliness
"Great way of reflection and revision"	Reflection and self-assessment:
"We can maintain the record of our clinical activities and share with others in an easy way."	Sharing and collaboration
"Can be reviewed whenever needed" "Useful when you look back in the future"	Long-term documentation and future reference
"Allows me to show my creativity"	Content customization and creativity
"More interested in class in order to create a portfolio."	Engagement with Clinical Cases
Student's illustrative quotes (few) on Demerits of E-portofio	*Emerged theme*
"It is slightly time consuming process for particularly MBBS students due to lack of technical knowledge, mainly village students."	Time consuming
"It is slightly time consuming process for particularly MBBS students due to lack of technical knowledge, mainly village students."	Technical challenges
"E portfolio requires the use of devices like laptop and tablet and many don't have access to it."	Device and resource limitations
"For the record or to keep a photo attached to the portfolio, consent needs to be asked. We can't just directly upload it on social platform."	Concerns about privacy and consent

Web Fig. 1 E-Portfolio snippets