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Assessing digital technology use for clinical learning in undergraduate health professional education in Ethiopia

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Background. The use of digital technologies in clinical placement training is becoming increasingly significant in global health education. However, limited research has been conducted on the use of digital technology in clinical placement training in low-income countries.
Objective. To assess the use of digital technology in the workplace by undergraduate health professional students throughout their clinical placements.
Methods. A multi-centre, cross-sectional survey study was carried out from May to September 2025 at three randomly selected universities in Ethiopia. Data were collected from 335 undergraduate students in the fields of medicine, nursing and radiological technology using a structured questionnaire on demographic information, frequency of use of digital technologies in the workplace, the challenges encountered in using them, and their experiences with their use. Descriptive statistics, independent sample *t*-tests, and one-way analysis of variance (ANOVA) were used for analysis.
Results. Undergraduate health professional students used digital technology extensively in their clinical placement studies. In clinical settings, 86.3% of students reported that they use digital technology to learn, and 67.8% said they use it frequently. These students use digital technology mainly to access educational material for their clinical practice. Despite this high use, students face several barriers, including lack of internet access and uncertainty about how supervisors, patients and caregivers will react to their use of digital technologies. The use of digital technology during clinical placement raises questions about the possibility of learning impairment because of overdependence and distraction.
Conclusion. Undergraduate students in the health professions make extensive use of digital technologies, mainly for accessing educational resources. While this shows the great usefulness of digital tools and their acceptance by students, there are many practical barriers to their successful use in clinical placements, such as unreliable internet access. In addition, the use of these technologies raises questions about how they are perceived by supervisors, patients and caregivers, as well as potential concerns about learning loss owing to distraction and extreme reliance on digital resources. Addressing infrastructure bottlenecks and providing clear guidance on how to use digital technologies optimally in clinical education is crucial.

Keywords: digital technology, clinical placement education, health professional education, Ethiopia, undergraduate student

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The workplace is an important site for professional learning and development throughout a career.[1,2] Workplace-based teaching and learning is a crucial component of health professions education (HPE) and is referred to as learning, that is situated in a setting originally and primarily designed for practising clinical skills.[3] Traditionally, the concept of 'learning' has been related to classroom-based learning, and the concept of workplace learning has expanded since the beginning of the 1990s.[1] Sfard[4] put forward two metaphors of learning: the acquisition metaphor sees learning as a process of knowledge acquisition, whereas the participation metaphor emphasises that learning takes place through participation in the practices of social communities. HPE involves the formal learning environment of universities and the clinical workplaces where students learn how to use their knowledge in the real world.[2]

Over the years, with the emergence of a range of learning technologies, digital technology (DT) has been widely adopted in education.[5] By 'digital technologies', we refer to those DTs that are used for teaching and learning. They include, for instance, learning management systems that have become widespread and essential for many institutions, learning analytics solutions, mobile or web-based applications for self-paced or supplementary learning, and virtual reality and artificial intelligence applications.[6] These technologies offer unprecedented opportunities for experiential learning and skill development. The use of DTs has increased significantly in recent years, and the use of tools such as virtual reality, video platforms, and mobile applications in clinical teaching has become widespread.[7] The role of DTs has fundamentally transformed modern healthcare and, consequently, HPE globally, demanding that future practitioners possess robust digital literacy and information retrieval skills.[8] Li *et al.*[9] reported that the flexibility and interactivity of mobile apps for learning may positively influence students' motivation. Moreover, they facilitate personalised learning pathways, allowing students to engage with content at their own pace and according to their learning styles. The rapidly changing use of technology in healthcare service delivery necessitates DT utilisation in HPE.[10] Higher education is one sector that is highly impacted by the advancement of information technology and technological innovations.[11] AMEE guide No. 154 emphasised that mobile technologies should be adopted to support workplace-based assessment

for entrustment decisions, as paper and pencil to document observations at the workplace have become almost obsolete with the advent of DT.[12] The use of digital media at the bedside remains controversial, and studies recommend that there should be a guideline for the challenges of learners' use of digital media.[13]

Digital resources provide health professional students with point-of-care access to decision-making tools such as drug references, medical calculators, and learning resources including textbooks and journal articles.[14] DTs can provide students with simulated clinical experiences and virtual patient cases, allowing them to practise and refine their skills.[15]

Despite the growing use of DTs in clinical placement learning, few studies have investigated how students use these technologies. In addition, little is known about how students use technology for learning or how health professional students decide how to use it when they are also supposed to learn through patient encounters. This study aims to examine the extent and nature of DT use by undergraduate health professional students during workplace-based clinical learning. More specifically, the study answered the following research questions:

1. To what extent do undergraduate health professional students use DTs during clinical practice in workplace settings?
2. What types of DTs are most accessed by students for clinical learning purposes?
3. How do students' use patterns of DTs vary across different health disciplines (e.g. medicine, nursing, allied health)?
4. What are the perceived benefits and challenges of using DTs in clinical learning among undergraduate health professional students?

This study provides valuable insights into how DTs are being utilised by undergraduate health professional students in Ethiopia during clinical practice. In a context where digital integration in education is rapidly evolving but unevenly implemented, understanding students' use patterns, preferences, and challenges is essential for shaping responsive and equitable educational strategies. The findings contribute to the global discourse on digital health education by highlighting the realities of technology use in low-resource clinical settings. Moreover, the study informs institutional decision-makers, educators, and policymakers about the need to strengthen infrastructure, digital literacy and curriculum alignment to enhance the quality and effectiveness of workplace-based learning.

Methods

A cross-sectional survey was conducted at three first-generation public universities in Ethiopia: Addis Ababa University, Arba Minch University, and Hawassa University. This design was used because it allowed the authors to collect the relevant evidence from participants at the three universities at one time, making the study efficient and practical. It also provided a straightforward way to describe the current situation and compare responses across the institutions without requiring long-term follow-up.

Participant and institutional context

Ethiopia provides free higher education to those who pass the national higher education entrance examination. The Federal Ministry of Education assigns candidates based on entrance exam results.

This study was carried out at the College of Health Sciences at Addis Ababa University, the College of Medicine and Health Sciences at Hawassa University and the College of Medicine and Health Sciences at Arba Minch University. The College of Health Sciences at Addis Ababa University comprises five schools: Medicine, Biomedicine and Laboratory Science, Nursing and Midwifery, Public Health and Pharmacy. Situated in the Sidama Region, Hawassa University currently offers approximately 14 undergraduate health programmes. Arba Minch University in the Southwest Ethiopian region also offers several undergraduate health professional programmes in the field of health professions. Participants were drawn from the medicine, nursing, and medical radiological technology schools of these universities. For the purposes of this study, students who had started clinical practice, namely third- and fourth-year nursing and radiological technologists and fourth- to sixth-year medical students, were included.

Population and sampling

A two-stage sampling approach was used to select the study participants. In the first stage, first-generation universities were purposively identified as the target group because they represent the earliest cohort of Ethiopia's higher education institutions, characterised by relatively mature academic structures, larger student bodies and well-established health sciences programmes. In the second stage, three universities were randomly selected from this group to ensure representativeness within the category and to reduce selection bias.

The sample size procedures for each programme were calculated via proportional allocation via the formula total sample size x n/N, where n = the number of clinical year students in each programme and N = the total number of students in each programme. A simple random sampling technique was then used to select the study respondents in each field of study. The list of study participants was obtained from the respective college registrar's office of the university.

Data collection instruments

A set of questionnaires, including an information sheet and consent form, were entered into KoboToolBox (Kobo Organization, USA), and the data were collected by a trained data collector. The data were collected via a link created using KoboToolBox; each link was restricted to a single use per respondent to prevent duplicate submissions. The link remained active for one month following sharing the link with the respondent, with two reminders sent during this period. To protect participant identity, data were de-identified during the export process. Personally identifiable information was stored separately from the analytical data set and was accessible only for follow-up interviews. Access to the raw data was strictly limited to the principal investigators. The system employed automated daily backups and firewall-protected database clusters to prevent data loss or unauthorised external access. Surveys with open and closed items were developed for students using items based on surveys reported in previous research into the use of DTs,[16-18] pilot-tested and refined before full implementation. Ethical approval was granted by the Addis Ababa University Institute of Educational Research, and the study was conducted in accordance with the Declaration of Helsinki. At least one investigator was involved in data collection. All the participants read an information sheet and provided written informed consent prior to completing the questionnaire. The questionnaire comprised items on demographic information, the frequency of DT use in the workplace, the purpose of using DTs at practical sites, the challenges faced while using DTs, whether DTs are used for assessment in clinical practice or not and their experiences with DT utilisation for assessment purposes in the workplace. Some questions with open-ended answers for further comments were

included in the survey. As part of the questionnaire, the students were asked the following questions: 'Other purpose(s) you use DTs at clinical placement?; describe any comments a clinical supervisor has made regarding your DT usage at their clinical practice; describe any comments a patient/caregiver has made regarding your digital device usage during the clinical setting; list the mobile applications pertinent to your field of study that you have utilised on your digital device(s); list the websites relevant to your field of study that you have used on your digital device(s) during the clinical setting; how does using digital devices improve learning in clinical settings?; how does using digital devices during clinical practices impair learning?; how can we facilitate the use of digital devices in the clinical setting to improve learning?; and please provide any additional thoughts or comments regarding the use of DTs for clinical teaching and learning.' The survey was conducted from 28 May to 20 September 2025.

Data analysis

IBM SPSS version 25.0 (IBM Corp., USA) was used to conduct statistical analysis. The collected data were exported from KoboToolBox into Excel (Microsoft, USA). Data clearance was performed in Excel, and the data were imported into SPSS. Once all the data had been collected, analysis was performed to identify and remove outliers. Means and standard deviations (SDs) were used to express quantitative variables. Descriptive statistics were used to analyse the data. Student's *t*-test and analysis of variance (ANOVA) were employed for means comparisons. A value of $p<0.05$ was considered statistically significant. The open-ended questions were categorised thematically and presented as frequencies of occurrence.

Results

From 28 May to 20 September 2025, we collected data from 335 undergraduate clinical year health professional students, 148 males and 187 females. A total of 193 students (57.6%) were medical students, 74 (22.1%) were nursing students and 68 (20.3%) were medical radiological technology students. The sample included students who had commenced clinical practice: third- and fourth-year nursing and radiological technology students, along with fourth- and fifth-year and internship medical students. The response counts by institution were 126 from Addis Ababa University, 104 from Arba Minch University, and 105 from Hawassa University (Table 1).

Approximately 289 (86.3%) students reported that they used DTs for learning purposes at clinical practice places, while only 46 (13.7%) did not.

The data on the frequency of digital device use for educational purposes during clinical practice, which were based on a survey with a 5-point Likert-type scale (1 = never, 5 = frequently), revealed that most of the respondents reported using digital devices frequently or almost every time (67.8%).

Perceived purposes of using digital technologies in clinical practice

The questionnaire consisted of eight items to rate the perceived purpose of using DTs in clinical practice places on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The data showed a positive response across all items, with all mean scores falling above 4.0, indicating that students generally find DTs useful for learning purposes in clinical practice (Fig. 1).

Perceived challenges faced by students

Students were asked to rate their perceptions of the seven items related to the challenges they faced while using DTs at their clinical placement on a similar 5-point Likert scale. The higher means indicated that the students agree with the item describing the underlying problem. The data revealed that a lack of internet access was the main challenge (mean 4.19). The means of the uncertainty of the supervisor's reaction and the patients'/caregivers' reactions were similar (mean 3.55) (Table 2).

DT use for assessment of learning in clinical practice

The participants were asked to rate their perceived experiences with the use of DTs in the assessment of learning on a similar 5-point Likert scale. The data suggest a generally positive view of technology's ease of use and contribution to the clinical learning assessment experiences, although dependability and timely feedback received lower scores, with means of 3.73 and 3.57, respectively (Table 3).

Scores

Comparisons of domains in DT use

An independent samples *t*-test was conducted to determine whether there were gender differences in students' perceived purposes of using digital technologies at clinical practice places. For all eight items under the purpose of DTs at clinical places Levene's test was not significant; all the *p*-values were well above 0.05, with the lowest value 0.166, so equal variances were assumed. The *t*-test results were not significant. There was no statistically significant difference between male and female students in their perceived purposes of DT utilisation for learning purposes at practical clinical sites (Supplementary Appendix A).

A one-way ANOVA was conducted to compare the mean perception of the purpose of using DTs for learning at work among samples from Addis Ababa, Arba Minch and Hawassa universities. This analysis produced a statistically non-significant result for three items: *I use DTs in the clinical setting to improve learning* ($F(2,332)=2.73$, $p=0.067$), *I use DTs in the clinical setting for communication purposes* ($F(2,332)=2.71$, $p=0.068$), and *I use DTs in the clinical setting to access teaching materials* ($F(2,332)=0.898$, $p=0.041$). However, a one-way ANOVA produced a significant result for the five remaining items: *I use DTs in the clinical setting to improve basic science knowledge and skills* ($F(2,332)=8.63$, $p=0.000221$), *I use DTs in the clinical setting to develop clinical knowledge and skills* ($F(2,332)=6.1$, $p=0.002$), *I use DTs in the clinical setting to access information on drug dosage* ($F(2,332)=9.6$, $p=0.000089$), and *I use DTs in the clinical setting to access up-to-date information* ($F(2,332)=8.09$, $p=0.00037$). For 5 of the 8 items, post hoc comparisons using the Tukey HSD (honestly significant difference) test indicated that Hawassa University reported significantly higher means of perceived use of DTs for the mentioned purposes than both other universities (see supplementary Appendix B). A one-way ANOVA revealed significant differences across the three universities regarding the use of digital devices to access drug dosage information ($F(2,332)=9.60$, $p<0.001$). The effect size, calculated using eta-squared (0.055), indicated a small-to-medium effect, suggesting that the university where the student is studying accounts for approximately 5.5% of the variance in the use of digital devices to access drug dosage information.

One-way ANOVA was conducted to compare the mean perceptions of DTs for clinical learning assessment at the workplace across the three universities. Only *DTs are dependable to use* (*I faced some limited technical issues*) produced non-significant results ($F(2,332)=0.22$, $p=0.803$)). There are statistically significant differences in mean scores among the three universities for 5 out of the 6 areas surveyed: *I found it easy to use DTs to record my activities*

Table 1. Participant frequency by university, gender, department and year of study

Field of study	Year of study		Gender		Total
			Male	Female	
Medicine	Year 4	Addis Ababa University	10	17	27
		Arba Minch University	8	20	28
		Hawassa University	12	6	18
		Total	30	43	73
	Year 5	Addis Ababa University	15	15	30
		Arba Minch University	3	12	15
		Hawassa University	8	13	21
		Total	26	40	66
	Internship	Addis Ababa University	12	11	23
		Arba Minch University	4	9	13
		Hawassa University	14	4	18
		Total	30	24	54
	Total	Addis Ababa University	37	43	80
		Arba Minch University	15	41	56
		Hawassa University	34	23	57
		Total	86	107	193
Nursing	Year 3	Addis Ababa University	7	8	15
		Arba Minch University	5	7	12
		Hawassa University	4	9	13
		Total	16	24	40
	Year 4	Addis Ababa University	5	3	8
		Arba Minch University	4	11	15
		Hawassa University	3	8	11
		Total	12	22	34
	Total	Addis Ababa University	12	11	23
		Arba Minch University	9	18	27
		Hawassa University	7	17	24
		Total	28	46	74
Medical radiological technology	Year 3	Addis Ababa University	4	9	13
		Arba Minch University	7	4	11
		Hawassa University	9	1	10
		Total	20	14	34
	Year 4	Addis Ababa University	7	3	10
		Arba Minch University	4	6	10
		Hawassa University	3	11	14
		Total	14	20	34
Total			**148**	**187**	**335**

($F(2,332)=3.68$, $p=0.026$); *DTs helped to facilitate appropriate supervision feedback between the preceptor and me* ($F(2,332)=4.096$, $p=0.017$); *the clinical supervisor gives me feedback using DTs in a timely fashion* ($F(2,332)=11.17$, $p=0.00002$); and *using DTs during clinical practice helped me identify areas of strength and areas for further growth in my clinical practice – my supervision feedback and narrative comments I recorded using DTs were helpful to my learning* ($F(2,332)=3.056$, $p=0.048$). Overall, the use of DTs in clinical learning contributed to a positive learning experience ($F(2,332)=3.73$, $p=0.025$).

Post hoc comparisons using the Tukey HSD test indicated that compared with Hawassa University students, Arba Minch University students reported a significantly more positive overall learning experience using DTs (Appendix C). The effect size, calculated with eta-squared (0.063), was medium, indicating that the student's university accounts for approximately 6.3% of the variance in clinical supervisor feedback using DT in a timely fashion.

Open-ended questions thematic analysis

The open-ended responses provided by participants were analysed using thematic analysis. Three major themes emerged: (*i*) the range of digital applications and websites used during clinical placements to support learning; (*ii*) the ways in which students, clinical preceptors, and patients engage with DTs; and (*iii*) the perceived advantages and challenges associated with the use of DTs in clinical placement settings.

Use of mobile apps and websites for learning during clinical placement

Most of the participants listed that they have used applications such as UpToDate, MSD Pro, Medscape, Nursing Central, Lab Values Reference, Human Anatomy Atlas, Anki, Notion, Memo AI, MRI Master, Amboss, Osmosis, STG, Radiology Assistant and PDF Readers. The participants also listed several websites, such as PubMed, Radiopaedia.org, Lecturio.

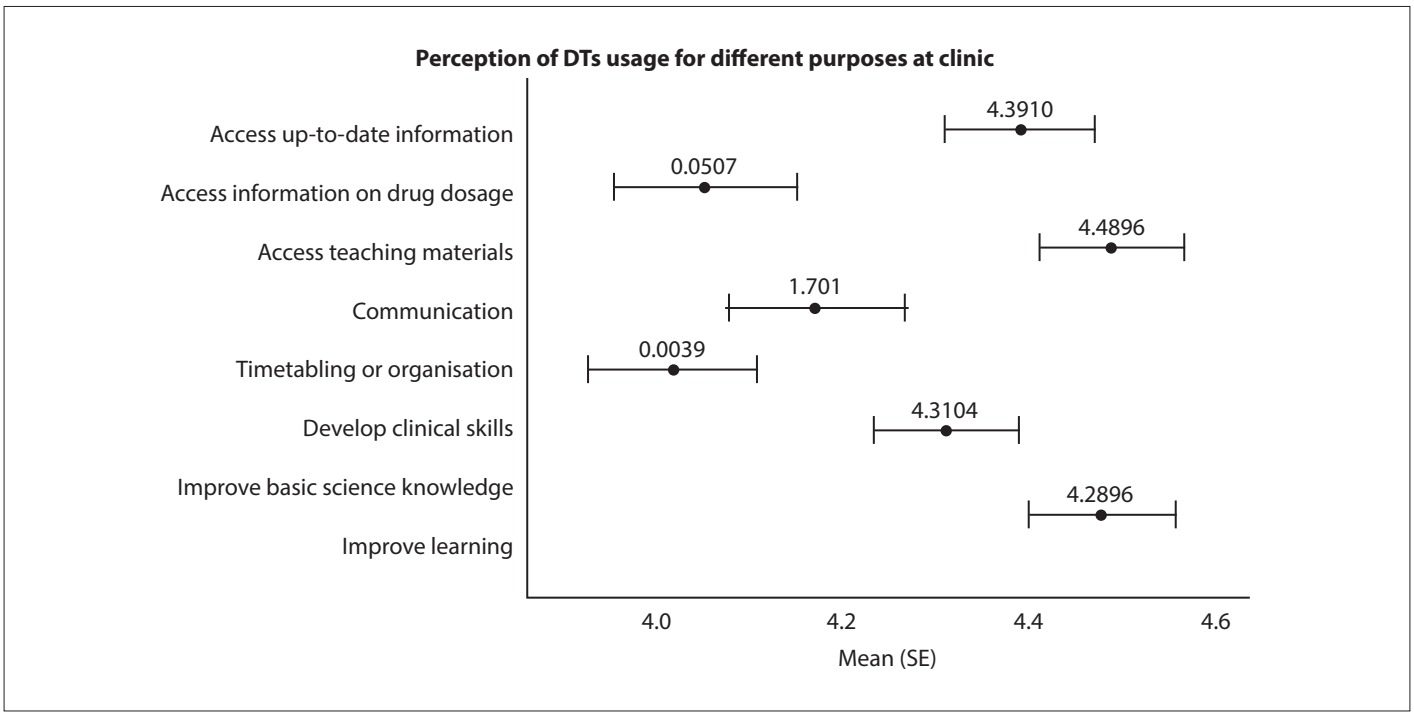

Fig. 1. Purposes of digital technologies for learning in clinical places (2E = standard errors of the mean).

Table 2. Ratings of the challenges students faced while using digital devices in clinical places

Challenge	Mean (SD)
I face technical difficulties while using DTs at clinical placement	3.48 (1.072)
I faced lack of Internet access at clinical practice placement	4.19 (0.860)
I faced difficulty of using DTs at clinical placement	2.89 (1.067)
Screen too small challenges me at clinical placement when I want to use DTs for learning	3.11 (1.167)
At clinical placement DT distracts me	3.38 (1.128)
At clinical placement I am unsure of supervisor's reaction	3.55 (1.054)
At clinical placement I am unsure of patients'/caregivers' reaction	3.55 (1.120)

Table 3. DT usage for assessment of learning in clinical practice

DT utility in assessment	Mean (SD)	Median	Variance
I found it easy to use the DTs to record my activities	4.23 (0.795)	4.00	0.633
The DTs are dependable to use (I faced some limited technical issues)	3.73 (0.923)	4.00	0.851
The DTs helped to facilitate appropriate supervision feedback between the preceptor and me	3.83 (0.955)	4.00	0.912
The clinical supervisor gives me feedback using DTs in a timely fashion	3.57 (1.078)	4.00	1.162
The supervision feedback and narrative comments I recorded using DTs were helpful to my learning	3.86 (0.910)	4.00	0.828
Overall, the use of DTs in clinical learning contributed to a positive learning experience	4.22 (0.766)	4.00	0.587

com, Teach Me Anatomy, ClinicalTrials.gov, Mayo Clinic, WHO, https://radiologyassistant.nl/, MRImaster.com, Nurseslabs, All Nurses.com, Nursing World, Radiology Key, Clinical Ultrasonography, National Library of Medicine, general search engines, social media, AI, LinkedIn Learning, Slideshare and different university websites.

Use of DTs for communication and feedback in clinical practice

Participants were asked whether they received any comments from their supervisor or patients regarding DTs use in clinical practice, and were asked to describe the comments. Students frequently encountered negative supervisor perceptions, with comments ranging from 'Stop using your phone' to concerns that devices make them look unprofessional or distracted, leading to the perception of 'Considering DT as a source of distraction'. Furthermore, students perceived that the patients and caregivers view mobile use negatively, fearing that it decreases their level of trust and makes them uncomfortable. In addition to these social and relational hurdles, supervisors also highlighted the academic risk of overdependence and the impact on the development of clinical skills, warning that dependency on technology, including AI, could lead to 'shallow knowledge' and a 'loss of independence'.

Advantages and challenges of using DTs at clinical placement

The participants were asked, 'What are the advantages of DT utilisation in improving learning in clinical settings?' Most participants mentioned that DTs are simple to use and offer quick, easy and immediate access to information. The participants also noted that the DTs significantly improved their learning experience, providing detailed explanations that help users better understand concepts encountered in clinical or practical settings. A major benefit was the ability to obtain updated information, which directly supports evidence-based practice and clinical decision-making. DTs facilitate learning through various formats, including visual aids such as videos, which are particularly helpful for understanding procedures, physical examinations and steps. The participants were asked what the disadvantages of DT utilisation in clinical settings are. They mentioned that the utilisation of DTs in clinical practice may impair learning by becoming a distraction, often specified as being 'drawn away' by social media, entertainment, or frequent notifications; wasting time; causing a 'lack of concentration' on the task at hand; and causing unhealthy dependence on the technology, which can negatively affect core learning skills and difficulty in choosing accurate information from the vast amount available.

Discussion

The findings of this study show that DTs were highly utilised in their learning among undergraduate students during clinical placement. Among the participants, approximately 86.3% reported DT use for learning at clinical sites, and a majority (67.8%) reported frequent use. The participants mentioned that they utilised DTs for different learning purposes during clinical placement learning. They used different mobile applications and websites to access educational resources for their learning at the clinical practice site. Despite their high level of utility, several problems were reported by participants: a lack of internet access, a critical infrastructural challenge that hinders the function of modern digital tools, and uncertainty about the reactions of both supervisors and patients/caregivers. The findings of this study also reveal that DTs cause learning impairment by nurturing overdependence and distraction. The participants reported a positive experience with DTs for assessment of learning, contributing to a positive overall learning experience. A lack of prompt input from clinical supervisors who use DTs, however, indicates a lack of optimisation of DTs for the clinical placement learning assessment process.

The study's finding that DTs are widely used in workplace-based learning among health professional students complements prior findings.[19] In line with the results of previous studies, we found that health professional students utilise DTs for different learning purposes during clinical placement.[6] This finding shows that different mobile applications and websites were used to access educational resources for their learning at the clinical practice site. Health professional students use mobile devices for improving learning, knowledge and skills in the clinical setting.[16-17] This study found that, in addition to educational materials and content produced by their own university, students tend to independently seek digital resources developed by other institutions during their clinical practice, and the finding has been supported by previous studies.[20,21]

Similar to previous studies,[22,23] our study reveals that the integration of DTs into HPE faces challenges such as a lack of internet access and a critical infrastructural challenge that hinders the function of modern digital tools. Although findings show that DTs are useful in supporting students' learning during clinical placements, participants reported that they are a cause of distraction and loss of time, often described as being 'distracted by social media, entertainment, or frequent notifications'. This leads to a *lack of focus* and a *waste of time*. Previous studies have shown that DTs are sources of distraction.[24-26] Information overload is another issue with using DTs in clinical practice. The abundance of data makes it difficult to choose reliable information from a wide range of sources, which raises questions about the information's validity and quality.[27] Chen *et al.*[28] found that information overload could lead to inefficient learning and deplete students' cognitive resources.

Another interesting finding reported in this study is that the use of DTs in the workplace for learning nurtures overdependence, which diminishes clinical skill development, self-confidence, and humanism. Students worry that reliance on DTs will hinder the development of core clinical reasoning and expertise. This finding is supported by another study in which emerging education technologies were used with caution against overdependence on technology impeding the development of clinical skills and humanism.[29] Clinical supervisors' mixed perceptions of students' use of DTs in clinical practice were also identified in this study. This study revealed that clinical supervisors' belief in the use of mobile phones to access information from the internet during clinical placement during learning causes distraction. According to Ellaway,[30] mobile devices disrupt educational interactions in clinical places by posing potential doubts and distrust in informal interactions.

Students were concerned about the reactions of patients and their caregivers to their use of a DTs. They perceived patients' and caregivers' interpretation of mobile use negatively, fearing it could decrease their level of trust and make them uncomfortable. In one study, students preferred not to use DTs in front of patients because they think using a mobile device will negatively impacted the interaction.[16] Illiger *et al.*[31] reported that some patients expressed concerns about the technology being too complicated to be used in a health context. Fawns and Schaepkens[32] discuss how technology can violate fundamental principles such as trust in medical education. To better comprehend the social advantages and disadvantages of technology in clinical practice, health professional students must be taught to acknowledge the co-construction of humans and technology.[33] This suggests that other social factors, in addition to functional and efficient considerations, influence the use of DTs in clinical placement learning.[34]

Our study also revealed that students reported a positive experience with DTs for assessment for learning, contributing to a positive overall learning experience. According to Johnson *et al.*,[35] feedback is widely used to augment the development of clinical expertise within HPE. A scoping review by Singaram *et al.*[36] indicated that DT use helps to provide immediate, personalised feedback and enhance formative assessment.

Strengths and limitations

This study provides valuable insights into the use of DTs by undergraduate health professional students in clinical settings across multiple institutions in Ethiopia. One of its key strengths lies in its multi-institutional scope, which enhances the diversity and generalisability of the findings. In addition, by focusing on real-time use of digital tools within workplace-based learning environments, the study provides practical evidence on how students engage with technology in authentic clinical contexts.

However, the study also has several limitations. Its cross-sectional survey design restricts the ability to assess changes over time or establish causal relationships between DT use and educational outcomes. Self-reported bias and lack of objective DT use data were other limitations of the study.

Furthermore, the absence of qualitative data limits the depth of understanding regarding students' lived experiences, motivations and contextual challenges. Without interviews or focus group insights, the study could not capture the nuanced ways in which digital technologies influence clinical learning, professional identity formation or interpersonal dynamics.

Conclusion

This study provides valuable insights into the use of DTs by undergraduate health professional students in Ethiopia during clinical practice. The findings indicate that students actively engage with a variety of digital tools, particularly mobile applications and online platforms, to support their clinical learning. These technologies are appreciated for enhancing access to information and promoting self-directed learning. However, students face several challenges, including limited infrastructure, inconsistent digital literacy, and a lack of structured integration of digital tools into clinical education. Usage patterns also vary across institutions, suggesting the need for tailored approaches. Overall, the study highlights the importance of intentional incorporation of DTs into workplace-based learning environments.

Implications of the study

The use of DT in HPE has promising prospects. The health professions curriculum should incorporate new competencies such as digital literacy while balancing the benefits and drawbacks of technology. With appropriate guidance and support, students can enhance their learning by using DTs. Higher education institutions should fulfil their responsibility by ensuring that all students are digitally literate and by providing on-campus advisory services to help students understand the benefits and drawbacks of using DTs for learning.

To improve the effectiveness of digital learning in clinical settings, institutions should consider formally integrating commonly used digital tools into clinical curricula. Ensuring reliable access to internet connectivity and digital devices across training sites is essential to support equitable learning opportunities. Faculty development and student training in digital literacy should be prioritised to help both groups navigate and critically evaluate digital resources. Additionally, educational strategies should be tailored to reflect the unique needs and usage patterns of different health disciplines. Future research should adopt longitudinal and qualitative approaches to explore how DTs influence clinical competence, professional identity formation and patient-centred care.

Given the limitations of this cross-sectional survey design, future research should adopt longitudinal approaches to better understand how DTs influence the development of clinical competencies and patient-centred care over time. Incorporating qualitative methods, such as interviews, focus groups, or ethnographic observations, would provide richer insights into students' lived experiences, contextual challenges, and the nuanced ways digital tools shape their learning and professional identity. Additionally, comparative studies across institutions or regions could help identify systemic factors that facilitate or hinder effective integration of digital technologies in clinical education, ultimately guiding more equitable and impactful educational strategies.

Data availability statement. Data are available from the corresponding author on reasonable request, subject to ethical and institutional requirements.

Declaration. The study received ethical approval from the Institutional Review Board of the Institute of Educational Research, Addis Ababa University (ref. no. IER-IRB-0019/2025).

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