



## *Increasing The Digital Health Competency of Salatiga City Pharmacists in The Era of Digital Health Transformation*

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### ABSTRACT

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**Background:** The Indonesia Ministry of Health has established six pillars of health transformation, one of which is health technology transformation. Pharmacist as a professional health care must have digital health competency to contribute to the success of digital health transformation in Indonesia.

**Objective:** This research aims to analyze and improve the digital health competency of Salatiga city pharmacists.

**Method:** This research is a quasi-experimental research with a one-group pretest-posttest design. The number of participants was 30 pharmacists from the city of Salatiga. Digital health competency levels were measured before and after training using the Public Health Informatics Competencies for Primary Health Care (PHIC4PHC) questionnaire instrument. Competency levels are presented as ordinal data so that the Wilcoxon test is used to determine differences before and after intervention.

**Result:** Participants in this study consisted of 63% pharmacists at pharmacies, 20% Primary Clinic pharmacists, and 17% Community Health Center pharmacists. Participants were aged between 26 and 47 years old with a period of pharmacist practice between 4 and 22 years. Analysis of respondents' digital health competency level before training obtained results of 2% basic level, 27% understanding level, 43% fluent level, and 23% expert level. Meanwhile, after 2 weeks of respondents applying the results of digital health training, there was an increase in respondents' competency to 30% fluent level and 70% expert level. The pharmacist's health competency increased significantly ( $p$ -value < 0.05). 20 participants increased their competency level, and 10 participants did not change their competency level.

**Conclusion:** Digital health training has been proven to significantly increase the digital health competency of Salatiga city pharmacists.

**Keywords:** e-Health, Telepharmacy, Informatics, Pharmacists, competence

## INTRODUCTION

The Indonesian Ministry of Health has developed six pillars of health transformation to achieve advanced Indonesia, namely through the transformation of Primary Services, Referral Services, Health Resilience Systems, Health Financing Systems, Health Human Resources, and Health Technology (1). The digital technology transformation of the health sector will have an impact on at least five things. First, improve the quality of health services. Second, make it easier to access health services. Third, increase the added value of the health sector economy with an orientation towards domestic products. Fourth, accelerate the achievement of government priority programs in the health sector. Fifth, increase the competency of health human resources while ensuring their distribution evenly throughout the country (1).

The digitalization of healthcare has many potential benefits including reducing turnaround times, medication errors, and

adverse drug events; better resource allocation; advancing preventative care, and enabling greater adherence to clinical guidelines (2,3). Despite the many benefits of digital health, the adoption of digital tools and technologies in healthcare has been slow in many countries, including the United States, Europe, and Australia (4,5). Poor digital health competency of health professionals was found to be the most common barrier to the adoption of digital health services (5). It should be emphasized that increasing digital Health competencies can lead to increased adoption of new digital tools and technologies among Health workers, because to increase the digitalization of health services, health professionals have been recognized as a key factor in the digital transformation of the health services sector. Therefore, they must be equipped with digital health competencies, ranging from basic skills (e.g. computers, and tablets) to more complex skills, such as teaching patients about the safe and appropriate use of data sources and digital technologies (6).

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Digitalization in healthcare has changed rapidly over the past decades, and online information and mobile phone applications play an increasingly large role in healthcare. Along with these changes, the skills to search for, select, assess, and apply online health information and healthcare-related digital applications are becoming increasingly important (7). This skill is called digital health literacy or e-health literacy (8). Digital health literacy is using information and communication technology to support health and health services (9).

Digital health literacy is a collection of six basic skills, namely traditional literacy, health literacy, information literacy, scientific literacy, media literacy, and computer literacy (8). On the other hand, digital health literacy not only requires the ability to search for health-related information, understand the information, and apply it appropriately but also demonstrates advanced technologies involving patient empowerment and engagement, information sharing, and social networking (10,11). Health professionals need to have health digitalization competencies because health professionals must be able to identify and use reliable sources of health information from the internet and other relevant information sources to make evidence-based medical decisions and to improve the delivery of health services to patients (8,12–14).

Digital competence is one of the key competencies for continuous learning both for personal life and for professional work (15). Pharmacists as health professionals must continuously update their knowledge and skills so they can keep up with developments with the latest trends in issues related to drug management and therapy. The Accreditation Council for Pharmacy Education defines Continuing Professional Development as “a lifelong process of active participation in learning activities that assists individuals in developing and maintaining ongoing competency, enhances their ability of professional practice, and supports the achievement of career goals.” Pharmacists must develop competency in providing centered care to patients; work as part of an interdisciplinary team; practice evidence-based medicine and focus on quality improvement (16).

Community pharmacists have an important role in improving public health, but advances in telehealth and digital technology mean that community pharmacists are changing the methods they use to serve customers and patients (17). Canadian community pharmacists frequently use digital health in their practice and recognize the benefits of this technology (18). Digital health will continue to be a key driver of practice transformation and improved quality of care (18).

Based on the background above, this study aimed to identify and analyze pharmacists' digital health competencies to support the achievement of Indonesia's health transformation, especially in the health digitalization transformation pillar.

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## MATERIALS AND METHODS

### Methods

This research is a quasi-experimental research with a one-group pretest-posttest design. Researchers chose to use a quasi-

experimental method because this method is similar to the experimental method but is more flexible in that it does not use random assignment (19). In this study, researchers were unable to carry out random assignment due to limited research subjects. The criteria for participants in this study were pharmacists who were still actively practicing in primary health care facilities such as public health centers, community pharmacies, or primary clinics; willing to become a research participant; and have practice experience minimum of 1 year as a pharmacist. Ethical approval is carried out at the Ngudi Waluyo University Ethics Committee for human research subjects with interventions, so informed consent is required as a form of participant consent in this research. This study was conducted in January 2024. The selection of pharmacists as respondents was determined using non-random method with an accidental sampling technique, where respondents involved in this research voluntarily agreed to become participants. The selection of participants was carried out through announcements in the WhatsApp group of the Indonesian Pharmacists Association of Salatiga City. Within 2 weeks, 30 pharmacists were found who were willing to be involved in the research. The number of subjects in this research meets the minimum sample rules for quantitative research, namely 30 subjects (20).

The level of digital health competency was measured before and after training. The training is carried out in accordance with the indicators to be measured, including knowledge and skills about health information systems, general computer skills, office and network application skills, knowledge about security and legality, skills for access, management, integration and evaluation of health information. The level of digital health competency was measured using the Public Health Informatics Competencies for Primary Health Care (PHIC4PHC) questionnaire instrument which consists of a total of 42 statements. This questionnaire is designed to measure the level of Health informatics competency of Health workers in primary healthcare facilities. The validity of this questionnaire has been tested for the population in Indonesia (21). The questionnaire measures: knowledge of health information systems with 8 statements, skills in using health information systems with 3 statements, general computer use skills with 10 statements, skills in using office applications with 9 statements, skills in using internet networks, knowledge of data security and validity, Health information access skills, Health information management skills, Health information integration skills, and Health information evaluation skills each with 2 statements. Each statement was selected using a Likert scale with answer choices from STS= Strongly disagree; TS=Disagree; ATS=Between agree and disagree; S=Agree; SS= Strongly agree. A positive statement is worth 5 if you strongly agree and 1 if you strongly disagree. A negative statement is worth 5 if you strongly disagree and 1 if you strongly agree. The total score of the 42 statements is then analyzed using the following formula to determine the level of competency:

$$PHIC4PHC = (((Q1 + Q2 + Q3 + Q4 + Q5.... + Q42)/42) - 1) * 50/4$$

The index values are then categorized as follows:  
0-25 = 'Basic'

>25 to 33 = 'Literacy' = understand  
 >33 to 42 = 'Fluency'  
 >42 = 'Mastery' = expert

The results of measuring differences in competency levels before and after training used non-parametric statistics with the Wilcoxon test using SPSS ver.26. Expert is coded 4, Fluent is coded 3, Understanding is coded 2 and Basic is coded 1 (22).

## RESULTS AND DISCUSSION

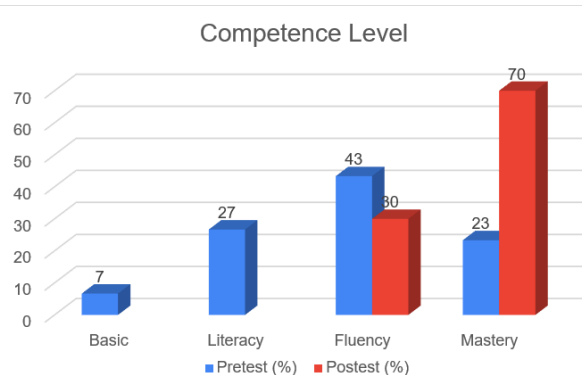
This research has been approved by the Research Ethics Commission of Ngudi Waluyo University with number: 0112/KEP/EC/UNW/2024 dated 19 January 2024. This research was conducted on 30 participants with data on the characteristics of various respondents and reviewed in terms of the type of professional practice place, gender, age, and length of practice experience listed in Table 1.

**Table 1. Participant Demographics**

Category	Information	Frequency (n)	%
<b>Place of Professional Practice</b>	Community Pharmacy	19	63
	Primary Clinics	6	20
	Public Health Center	5	17
<b>Gender</b>	Male	3	10
	Female	27	90
<b>Age (Years)</b> (Mean±SD = 35,6±6,1)	26 – 35	15	50
	36 – 45	14	47
	46 – 55	1	3
<b>Length of practice experience (Years)</b> (Mean±SD = 12,5±5,5)	1-10	10	33
	11 – 20	18	60
	>20	2	7

The characteristics of the participants in this study, in terms of gender, are more dominant, namely female respondents. This is by data from the Indonesian Pharmacists Association, Salatiga City Branch Managers, where pharmacists are dominated by women. Respondents' ages varied, most were in the range of 26-35 year. The two characteristics of the pharmacist profession in this study are in line with research conducted by Ebtavanny, 2023 where female pharmacists dominate as research respondents at 84% and the age of most respondents is in the range of 26-35 years (23).

The results of filling in the PHIC4PHC questionnaire which consists of 42 statements were analyzed to determine the competency level of pharmacists before and after training. Figure 1 shows an overview of participants' digital health competency levels before the training, with results of 7% basic level, 27% understanding level, 43% fluent level, and 23% expert level. Meanwhile, after 2 weeks of respondents applying the results of digital health training, there was an increase in respondents' competency to 30% fluent level and 70% expert level.



**Figure 1.** Digital health competency level of Salatiga City pharmacists before and after training

The average pretest score of 36.32 shows that the digital health competency of Salatiga city pharmacists is at the Current Level. The digital health competency level of Salatiga city pharmacists increased to expert with a posttest score of 43.42 after receiving training and carrying out pharmaceutical services by utilizing digital health technology. Salatiga City pharmacists are expected to be able to apply digital health technology in daily pharmacy practice to improve performance benchmarks for health service workers, including service delivery, diagnosis, clinical management, prescription-related practices, patient follow-up, and data management. Moreover, digital health technology can improve interprofessional communication, compliance with clinical protocol standards, and the personal skills and

competencies of healthcare workers. Health worker performance improves with the use of correlated digital Health technology to optimize communication skills; reliable and fast access to data; development of professional expertise and skills; increased productivity, efficacy, and accuracy; improving service quality; reduced time commitment to professional activities; and advance the acquisition of knowledge (24).

The results of statistical tests using the Wilcoxon test using SPSS ver.26 showed that the level of digital health competency of participants before and after training was significantly different (Asymp. Sig 0.00 < 0.05). With 20 participants experiencing an increase in their competency level and 10 participants maintaining their competency level. These findings are in line with research by Kanfe, 2022 (25). found significant factors that determine the knowledge and attitudes of health workers towards the use of digital health information systems. Efforts to provide adequate training, adequate resources, skills related to

the use of digital health information systems, increased motivation and feedback will help improve and achieve the expected knowledge and attitudes that support the use of digital health information systems to improve the quality of health services.

Analysis of the level of digital health competency of pharmacists in the city of Salatiga according to the division of indicators in the questionnaire. The digital health competency indicators measured using the PHIC4PHC questionnaire consist of 4 general categories and 10 indicators. Based on research results, the average digital health competency level of pharmacists before training had 9 indicators in the fluent category and 1 in the understanding category, namely in the skills category for using health information systems. After training, the pharmacist's digital health competency level in all indicators is in the expert category as can be seen in table 2.

**Table 2. Analysis of the competence level for each category**

Main Categories	Indicator	Competence Level on	
		Pretest	Posttest
1. Cognitive Skills	<i>Health information system knowledge</i>	Fluency	Mastery
	<i>Health information system skills</i>	Literacy	Mastery
2. Technical Proficiency	<i>General computer skills</i>	Fluency	Mastery
	<i>Office application skills</i>	Fluency	Mastery
	<i>Network skills</i>	Fluency	Mastery
3. Ethical Skills	<i>Security and Legal Knowledge</i>	Fluency	Mastery
4. Health Information Literacy	<i>Health information access</i>	Fluency	Mastery
	<i>Health information management</i>	Fluency	Mastery
	<i>Health information integration</i>	Fluency	Mastery
	<i>Health information evaluation</i>	Fluency	Mastery

Cognitive proficiency includes knowledge and skills in health information systems. The cognitive skills of pharmacists in the city of Salatiga before receiving digital health training were at a fluent and understanding level and increased to an expert level after receiving the training. WHO has identified that the problem of incomplete reporting is enormous and is related to a lack of knowledge and attitudes among health workers characterized by a lack of analytical skills, training, and lack of initiative in using information (26,27). Understanding the attitudes and knowledge of health service providers towards the use of digital health information systems is important for the provision of effective and efficient health services (28). The use of digital health information systems is expected to improve the quality of health services, but the lack of positive attitudes and adequate knowledge is one of the main factors that hinder the use of digital health information systems among health service providers (28–30). Determining the attitudes and knowledge of healthcare providers will also help in understanding the impact of DHIS on the workload and quality of clinical healthcare services (28,31).

The use of health information systems in Sub-Saharan Africa is too low due to low knowledge and attitudes of Health service providers (28). The level of digital health competency of Salatiga City pharmacists is already at the expert level, so it is hoped that pharmacists will be able to support the digitalization of health transformation.

The technical skills of health workers include computer usage skills, office application operating skills, and internet networking skills. The digital health technical skills of Salatiga city pharmacists before receiving training were at a fluent level and increased to expert after training. Computer literacy can be described as the computer-related knowledge necessary to acquire, communicate, process, and understand the basic knowledge necessary to make appropriate health decisions (32). Health workers must be skilled in the use of information communication and technology (ICT) and must continue to be developed (33). The adoption of digital health technologies will depend largely on users' computer skills. Given the enormous data requirements and increasing patient care, there is an urgent

need for all healthcare professionals to have technical computer proficiency to meet the need for better healthcare through electronic healthcare tools, which are growing rapidly across the world (34–36). Since most of the study respondents were of active age and had many years of work experience, they should be encouraged to self-direct computer appreciation training and more on-the-job training. This research is in line with the results of Sibiyah's research, 2023 that there is a need for ongoing training and retraining of existing staff, and computer literacy should be emphasized as part of the requirements for future employment. Computer operating skills and knowledge are big determining factors in the adoption of digital health technologies (37).

Salatiga city pharmacists' health information technology ethical skills were initially at a fluent level and after receiving the training they became expert levels. Ethical skills in the use of digital health technology relate to health workers' knowledge of security and law. The healthcare sector can benefit greatly from developments in digital technology. The development of digital health applications must guarantee the privacy and safety of patients and the data collected (38). The topic of security and legal data in health information technology has received a lot of attention. To prevent potentially slowing factors in the development and implementation of digital health, we need to do the following: privacy and independence; consent and comfort; clinical research and routine clinical data; responsibility and standardization; and privacy and solidarity (38). Pharmacists must be able to sort legal data and secure patient data in the information system used.

Health information literacy includes access, management, integration, and evaluation of health information. The competency of Salatiga city pharmacists in the health information literacy component before the training was at a fluent level and increased to expert after the training. Health literacy is essential to enable healthcare providers to integrate evidence-based knowledge into their professional practice (39,40). Health literacy is also important to ensure the health and well-being of health service providers themselves, as well as those around them (for example the patients they care for) (41). Analysis of the level of digital health competency of pharmacists in the city of Salatiga in this research is still limited to a framework of 10 indicators, but several other frameworks can measure the digital competency of health workers from other indicators. The digital capabilities of the pharmaceutical workforce can be further tailored to pharmacy practice through the inclusion of specific examples of digital technologies and digital skills relevant to the pharmaceutical field (42). Numerous studies have shown that health professionals' lack of health literacy contributes to poor health outcomes (higher mortality rates and poorer overall health status), health disparities, and increased costs (43–45). The increasingly complex and fragmented healthcare system and growing patient demands for self-care, care coordination, and system navigation require increasingly strengthened health literacy (45).

Pharmacy's growing role in collaborative healthcare teams increasingly relies on a variety of digital health technologies and digital literacy. Increasing digital health competency can be obtained through training. In Indonesia, there is no digital health

training scheme, especially for the clinical role of pharmacists. Limited evidence was found regarding positive digital literacy training experiences. Pharmacists want or need more digital literacy training. The recommended core competencies for pharmacy informatics are based on digital literacy and so can be a starting point for further research, which should be expanded to include all pharmacy staff. Along with the growing role of pharmacists (46).

In launching the US Government's Digital Strategy in 2012, President Obama stated, 'I want us to ask ourselves every day, how can we use technology to make a real difference in people's lives' (47). As the role of pharmacy in health services continues to grow, it is necessary to increase pharmacists' digital skills, most recently from the UK Academy of Medical Royal Colleges which emphasized the need to 'increase professional skills in the field of digital health technology so that the significant benefits that can be generated by technology can be realized' (48). Digitalization has not yet been fully implemented in clinical practice, and several factors have been identified as possible barriers, including the competence of healthcare professionals (49). Increasing the healthcare digitalization competence of healthcare professionals has been recognized as a key factor in the digital transformation of the healthcare sector (6).

The limitations of this study are the small population size and low willingness of subjects to become samples, so it can only use non-probability sampling. Participants only practiced in community pharmacies, primary health care facilities and public health centers. There is no participants that practiced in hospitals. In the future, it is hoped that it can reach a larger number of subjects so that it can capture a broader picture of pharmacists' digital literacy competencies.

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## CONCLUSION

The digital health competency level of pharmacists in the city of Salatiga has increased significantly after participating in pharmacy digitalization training and is ready to support digital health transformation in pharmaceutical services in particular.

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## CONFLICT OF INTEREST

There is no conflict of interest in the research that has been carried out.

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