



## **EDUCATION ON IDENTIFICATION OF DRUG EXPIRATION DATES AND CALCULATION OF BEYOND USE DATES FOR OUTPATIENT PHARMACY INSTALLATION PATIENTS AT RSKB HEART AND SUGERY HOSPITAL, BANGKALAN REGENCY**

**Nurus Shubuh<sup>1</sup>, Nai'matul Retno Faizah<sup>2</sup>, Octaviana Dyah<sup>3</sup>**

<sup>1,2,3</sup>S1 Pharmacy, Seventeenth Health Sciences College, Karanganyar

[nurusshubuh123@gmail.com](mailto:nurusshubuh123@gmail.com)

### **Abstract**

This study aims to evaluate the effectiveness of education on identifying drug expiration dates and calculating the Beyond Use Date (BUD) among outpatients at the Pharmacy Installation of RSKB Heart and Surgery Hospital, Bangkalan Regency. The results showed that patients' understanding before receiving education was relatively low, particularly in distinguishing between the Expiry Date and Beyond Use Date, reading expiration labels, and recognizing the risks of using expired medications. After the educational intervention, which included counseling sessions and informational leaflets, there was a significant improvement in patient understanding. This was supported by the Wilcoxon Signed Rank Test results, showing a significance value of

0.000 ( $< 0.05$ ), indicating a meaningful difference in comprehension before and after the intervention. These findings align with previous studies (Ainni et al., 2024; Iskandar et al., 2022; Rosanti et al., 2023), which also demonstrated the effectiveness of education through counseling, discussions, and media such as leaflets in enhancing public and patient knowledge about drug expiration and BUD. Therefore, regular pharmaceutical education plays a crucial role in improving patient awareness and medication safety, particularly in understanding expiration and BUD calculations, thereby helping to prevent the use of unsuitable drugs and enhancing patient safety.

**Keywords:** *Pharmaceutical Education, Drug Expiration, Beyond Use Date (BUD), Patient Understanding, Medication Safety*

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✉ Corresponding author :

Address : S1 Pharmacy, Seventeenth Health Sciences College, Karanganyar

Email : [nurusshubuh123@gmail.com](mailto:nurusshubuh123@gmail.com)

**INTRODUCTION**

Medications are a vital component of healthcare services, playing a key role in the healing process and maintaining patient health. However, the use of drugs past their expiration date or Beyond Use Date (BUD) can negatively impact therapeutic effectiveness and pose health risks to patients (WHO, 2020).

Medications used after their expiration date may lead to several adverse effects, including reduced potency or effectiveness of the active ingredients, resulting in diminished therapeutic benefits. In some cases—particularly with drugs that contain chemically unstable compounds—using them past their expiration date may lead to the formation of toxic degradation products, which can be harmful to the body. Moreover, the consumption of ineffective drugs can worsen a patient's condition, increase the risk of complications, and prolong the healing process. For antibiotics, the use of expired medication may contribute to antimicrobial resistance, one of the major global challenges in infection management (Koerniawan & Rosmiati, 2023).

According to the Directorate General of Pharmaceuticals and Medical Devices of the Indonesian Ministry of Health, it is crucial for the public to understand the correct methods of storing and disposing of expired medications to prevent health and environmental hazards.

If a medication has passed its expiration date, it is strongly advised not to consume it and to dispose of it safely—for example, by returning it to a pharmacy or healthcare facility that provides proper drug disposal programs.

The potential risks include reduced drug effectiveness, changes in chemical composition that may cause toxic effects, and an increased likelihood of drug resistance, especially in antibiotics (Hossain, 2024). Therefore, public awareness—particularly among outpatients—about drug expiration and BUD calculation is a critical aspect in improving medication safety.

According to a study conducted by (Alnahdi, 2020), many patients still lack understanding of how to read medication expiration dates and differentiate them from the Beyond Use Date (BUD). The expiration date listed on a drug's packaging indicates the period during which the manufacturer guarantees the medication's effectiveness and safety (Hossain, 2024). In contrast, the Beyond Use Date refers to the period after which a medication—once opened or repackaged by a pharmacist—should no longer be used (Iskandar et al., 2022). A lack of knowledge regarding this distinction can lead to the use of ineffective or potentially harmful

medications. Additionally, some patients tend to store expired medications under the assumption that they are still usable, without understanding the potential health risks (Octovian et al., 2025).

Field observations at the Outpatient Pharmacy Installation of RSKB Heart and Surgery Hospital in Bangkalan Regency reveal that many patients still pay little attention to expiration dates or proper storage methods. This can result in the use of unfit medications—either due to having passed their expiration dates or due to improper storage conditions that deviate from recommended guidelines. Moreover, many patients continue to ask nurses about expiration dates even though the information has been provided verbally and in writing by the pharmacy department upon medication handover. This indicates that patient understanding of the information provided remains suboptimal—either due to inattention during the explanation or limited knowledge of pharmaceutical terminology.

Therefore, continuous and appropriate education is necessary to improve patient understanding of how to identify expiration dates and calculate Beyond Use Dates. Previous studies have shown that improper storage—such as exposure to high temperatures or humidity—can accelerate the degradation of active ingredients in medications, thereby reducing their effectiveness even before the stated expiration date (Octovian et al., 2025).

Health education is one of the most effective strategies to raise patient awareness about safe and rational medication use (Rosanti et al., 2023). Proper education can help patients understand critical information printed on medication packaging, such as how to read expiration dates, differentiate between expiration dates and Beyond Use Dates, and learn correct storage practices to maintain drug effectiveness. Furthermore, education also plays a key role in increasing patient awareness about the dangers of using expired medications, whether in tablet, capsule, syrup, or ointment form (Iskandar et al., 2022).

This study aims to evaluate the effectiveness of educational efforts on identifying medication expiration dates and calculating Beyond Use Dates among outpatients at RSKB Heart and Surgery Hospital, Bangkalan Regency. The results of this study are expected to contribute to improving patient awareness and understanding of medication safety, and to serve as a reference for pharmacists in developing more effective educational strategies in the future. With proper and systematic education, patients are expected to become more cautious in

storing, using, and disposing of expired medications—thus reducing the risk of adverse effects and enhancing overall treatment effectiveness.

METHOD

Population

According to (Sugiyono, 2019), a population is the entire group of research objects that possess certain characteristics defined by the researcher to be studied and from which conclusions will be drawn. Meanwhile, (Creswell, J. W., & Creswell, 2022) emphasize that selecting an appropriate population increases the validity of the study and enables better generalization of the results.

The population in this study consists of all patients receiving treatment at the Outpatient Pharmacy Installation of RSKB Heart and Surgery Hospital in Bangkalan Regency. This population was selected based on the need for education regarding the identification of drug expiration dates and the calculation of Beyond Use Date (BUD), aimed at improving medication safety.

Sample

A sample is a subset of the population that shares the same characteristics (Sugiyono, 2019). In this study, the sample will be determined using the purposive sampling technique, which involves selecting respondents based on specific criteria.

Inclusion criteria for the sample are as follows:

- a. Outpatients who receive medication from the Pharmacy Installation.
- b. Willingness to participate in the educational session and the research.
- c. Ability to read and understand medication- related information.

Exclusion criteria include:

- Patients with conditions that prevent them from participating in the education.
- Patients who are unwilling to participate in the research.

Materials and Instruments

The research instruments used in this study include:

- 1. Questionnaire using a Likert scale to measure

patients’ level of understanding before and after the educational intervention (Likert, 1932). The questionnaire consists of two parts:

- a. Part 1 (Pre-Test): Measures patients’ initial understanding of drug expiration dates and the Beyond Use Date before receiving education.
- b. Part 2 (Post-Test): Measures the improvement in patient understanding after the educational session.

The Likert scale is used to assess the level of patient comprehension regarding identification of drug expiration dates and calculation of the Beyond Use Date, both before and after the educational intervention. The questionnaire items are developed based on key aspects of patient understanding, such as:

- a. Ability to read medication expiration dates.
- b. Understanding the difference between Expiry Date and Beyond Use Date. Knowledge of proper drug storage methods.
- c. Awareness of the risks of using expired medications.

Respondents are asked to indicate their level of agreement with each statement using the following scale:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5= Strongly Agree

- 2. **Observation sheet**, used to assess patients' understanding in identifying drug expiration dates and calculating Beyond Use Dates.
- 3. Educational material in the form of a leaflet (Nielsen, S., 2020).

Location and Time of Research Location of Research

This research was conducted at the Outpatient Pharmacy Installation of RSKB Heart and Surgery Hospital, Bangkalan Regency. According to (Bordens, K. S., & Abbott, 2022) determining a clear location and time of research will help in managing time and resources more effectively.

Time of Research

The research implementation time took place from March to April 2025, with stages of preparation, implementation, and data analysis.

RESULT AND DISCUSSION

Table 1. Distribution of Respondent Characteristics

Characteristics	Amount (n)	Percentage (%)
Gender		
Male	15	50%
Female	15	50%
Age		
< 25 years	4	13.3%
25 - 40 years	12	40%
> 40 years	14	46.7%
Level of Education		
Elementary School - Middle School	5	16.7%
High school/equivalent	17	56.7%
College	8	26.6%

Based on the table above, the gender composition of respondents is quite balanced between men and women. In terms of age, most respondents are in the productive age group, namely 25 to 40 years (40%) and over 40 years (46.7%), who generally have higher health information needs. Meanwhile, the majority of respondents have a minimum education level of high school/equivalent (56.7%), which is

expected to facilitate the process of understanding the educational information provided.

Level of Patient Understanding Before and After Education

Assessment of the level of patient understanding regarding drug expiration dates and Beyond Use Dates (BUD) was carried out using pre-test and post-test questionnaires with a Likert scale. This measurement aims to determine how much knowledge patients have before being given education and the extent to which knowledge has increased after education is carried out.

Pre-Test Results

Before being given education, respondents were asked to fill out a questionnaire to measure their initial understanding regarding drug expiration dates and BUD calculations. The results of filling out the pre-test questionnaire are presented in the following table:

Table 2. Results of the Patient Understanding Pre-Test

Understanding Category	Number of Respondents (n)	Percentage (%)
Good (Score $\geq 76$ )	4	13.3%
Moderate (Score 56 - 75)	8	26.7%
Poor (Score $\leq 55$ )	18	60%

Based on the pre-test results, the majority of respondents (60%) had a low level of understanding regarding drug expiration dates and BUD. Only a small portion (13.3%) showed a good level of understanding. This shows that most patients do not yet have adequate knowledge regarding the importance of paying attention to drug expiration dates and BUD calculations before educational interventions are carried out.

Post-Test Results

After being given education including oral explanations, leaflet distribution, and discussion sessions, respondents were again asked to fill out the post-test questionnaire to measure the increase in understanding. The results of filling out the post- test questionnaire are shown in the following table:

Table 3. Post-Test Results of Patient Understanding

Understanding Category	Number of Respondents (n)	Percentage (%)
Good (Score $\geq 76$ )	22	73.3%
Moderate (Score 56 - 75)	7	23.3%
Poor (Score $\leq 55$ )	1	3.4%

The post-test results showed a significant increase in the level of patient understanding. Most respondents (73.3%) showed a good level of understanding after receiving education. The number of respondents with poor understanding decreased drastically to only 3.4%. This finding indicates that the education provided was effective in increasing patient knowledge regarding drug expiration dates and BUD

calculations, in accordance with the objectives of this study.

Wilcoxon Signed Rank Test Statistical Test

To determine whether there is a significant difference between the level of patient understanding before and after being given education regarding drug expiration dates and Beyond Use Date (BUD), an analysis was carried out using the Wilcoxon Signed Rank Test. This



test is used because the data obtained is ordinal and comes from two paired measurements, namely before and after the educational

intervention (Ghasemi, A., & Zahediasl, 2012). The following are the test results obtained:

Table 4. Results of the Wilcoxon Signed Rank Test Statistical Test

Rated Aspect	Z Count	p-value	Information
Pre-Test and Post-Test Understanding Levels	-4.561	0.000	Significant

Based on the table above, the Asymp. Sig (2- tailed) value is 0.000, which means it is smaller than the set significance level ( $\alpha = 0.05$ ). Thus, it can be concluded that there is a significant difference between the level of patient understanding before and after being given education.

The results of the analysis show that providing direct education, accompanied by informative leaflet media, is effective in increasing patient understanding regarding drug expiration dates and Beyond Use Date calculations. This is in line with previous studies which state that structured education can increase patient awareness and knowledge in the safe use of drugs (Nielsen, 2020).

Thus, the hypothesis in this study which states that "Education can increase the level of patient understanding regarding drug expiration dates and Beyond Use Date (BUD) calculations" can be accepted.

Discussion

The results of this study indicate that education on medication expiration dates and Beyond Use Date (BUD) significantly improves patients' level of understanding. Prior to the educational intervention, most patients demonstrated a low level of understanding, which could increase the risk of using expired or unfit medications. After receiving education in the form of verbal explanations, leaflets, and direct discussions, a notable improvement in understanding was observed. This finding aligns with research by (Nielsen, S., 2020), which showed that leaflet-based education can enhance patients' health literacy.

Furthermore, the improvement in patient understanding is supported by the theory proposed by (Creswell, J. W., & Creswell, 2022), stating that systematic educational interventions can enhance individuals' knowledge and attitudes toward health- related topics.

This finding is also consistent with similar research in the field of pharmacy, which shows that patient education can improve both compliance and knowledge related to medication use (Pallant, 2020).

The results are in line with a study by (Iskandar et al., 2022) at RSUD Dr. R. Koesma Hospital in Tuban Regency, which also showed

an increase in knowledge among participants regarding the use-by time of medications after being removed from their primary packaging (BUD). The educational method used—consisting of counseling and discussion, supported by leaflet materials—is similar to that employed in this study. Differences lie in the location, timing, and additional educational media used.

Additionally, the findings of this research are consistent with a study by Ainni et al. (2024) conducted in the Mergosono community, Kebumen. That study found that education using lectures, counseling, and discussions increased participants' knowledge of BUD by 29.1%, moving from the "poor" to the "good" category. Although the research location and target population differ (i.e., general public), the similarity in using leaflet- based education demonstrates the method's effectiveness in improving understanding of BUD. Moreover, this study aligns with findings by Rosanti et al. (2023) at Martapura Hospital, which revealed that education about Beyond Use Date and Expired Date, conducted through counseling, discussions, and media support such as leaflets, banners, and educational videos, increased participant knowledge to an average of 88%, categorized as "good." This shows that a variety of educational media can further strengthen participant understanding, in accordance with learning theory, which states that combining visual, audio, and textual elements enhances information retention (Nielsen, 2020).

From these three studies, it can be concluded that structured educational efforts, accompanied by appropriate educational materials such as leaflets, significantly improve public or patient understanding regarding medication expiration and BUD. This study strengthens the evidence that educational initiatives at the Outpatient Pharmacy Installation of RSKB Heart and Surgery Hospital, Bangkalan Regency, are also effective in increasing patient awareness and knowledge, thus encouraging safer medication practices.

This study differs from previous research in terms of respondent characteristics and location. While earlier studies were conducted in general hospitals or wider community settings, this research specifically focused on patients at the Outpatient Pharmacy Installation of RSKB

Heart and Surgery Hospital, with stricter inclusion criteria. Moreover, although similar educational media (leaflets) were used, this study also emphasizes the importance of direct observation of patient behavior in identifying drug expiration dates as a form of non-verbal evaluation of educational success.

However, a small proportion of patients still showed less-than-optimal improvement in understanding. This may be attributed to factors such as age, education level, or limited ability to comprehend the information provided.

CONCLUSION

Based on the research conducted on education regarding the identification of medication expiration dates and the calculation of Beyond Use Date (BUD) among outpatients at the Pharmacy Installation of RSKB Heart and Surgery Hospital in Bangkalan Regency, the following conclusions can be drawn:

1. Patients' level of understanding prior to the educational intervention was relatively low, as indicated by varied pre-test scores and a general lack of comprehension regarding the differences between Expiry Date and Beyond Use Date. In addition, knowledge about how to read expiration dates and the risks of using expired medications was minimal.
2. Educational interventions in the form of counseling and the use of leaflets significantly improved patients' understanding of medication expiration dates and BUD. This was confirmed by the Wilcoxon Signed Rank Test, which showed a significance value of 0.000 ( $< 0.05$ ), indicating a meaningful difference in patient comprehension before and after the education.
3. The findings of this study are consistent with several previous studies (Ainni et al., 2024; Iskandar et al., 2022; Rosanti et al., 2023), all of which demonstrate that education through counseling, discussion, and the use of materials such as leaflets is effective in enhancing public and patient knowledge regarding medication expiration and BUD.
4. Routine pharmaceutical education has proven to play an important role in increasing patient awareness and understanding of safe medication use—particularly in relation to expiration dates and BUD—thereby helping to prevent the use of unfit medications and improving overall patient safety.

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