

## Overview of Pharmaceutical Personnel's Knowledge of Good Compounding Practices in Community Pharmacies

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### ABSTRACT

Compounding is a process of preparing medications tailored to the individual needs of patients by pharmaceutical personnel, due to the limited availability of ready-made drug formulations. Knowledge of drug compounding is essential for pharmaceutical personnel to ensure the availability of quality medications that are safe and effective in achieving therapeutic goals. This study aimed to assess the level of knowledge of pharmaceutical personnel regarding proper compounding practices in pharmacies in Lamongan. A descriptive cross-sectional study was conducted from February to April 2024 using a structured questionnaire administered to pharmacy personnel in community pharmacies. A total of 70 respondents were selected through simple random sampling. Data were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations, to summarize respondents' knowledge of Good Compounding Practice. The results showed that out of 70 respondents, the majority (58 respondents; 83%) had good knowledge, 7 respondents (10%) had moderate knowledge, and 5 respondents (7%) had poor knowledge. Knowledge of good compounding practice among pharmaceutical personnel indicated that the highest percentage of correct answers was in the category of compounding definition (97%), while the moderate level of answers was found in the category of compounding aspects (75%). Based on these findings, it can be concluded that pharmaceutical personnel working in pharmacies in Lamongan have, in general, good knowledge of compounding.

Keywords: *Pharmacy, Compounding, Knowledge, Pharmaceutical Personnel.*

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### Introduction

A pharmacy is a pharmaceutical service facility managed by a pharmacist in accordance with the Regulation of the Minister of Health of the Republic of Indonesia No. 9 of 2017. Its functions include providing medicines, information, and counseling services to the community. One of the services that can be offered is compounding, which involves preparing or formulating medications according to the individual needs of patients when such medicines are not available in manufactured products (Sriwijaya *et al.*, 2022). Compounding is defined as the practice of customizing

medications by pharmacists to meet the individual needs of patients through various methods such as mixing, grinding, molding, and modifying dosage forms. This practice is particularly important for pediatric, geriatric, or special cases where commercial drug preparations are unavailable or unsuitable. It emphasizes that compounding is an essential component of modern pharmaceutical services to ensure safe, effective, and personalized therapy (Al Shammari *et al.*, 2021)

Limited forms and dosages of manufactured drugs. A study conducted in a private hospital in Yogyakarta showed that although most active substances are available in licensed formulations, some still require compounding, making it an important solution in pharmaceutical services (D. C. A. Putri *et al.*, 2021). Studies show that children often require medications in specific doses that are not commercially available, making compounding an important solution. However, this process presents its own challenges, such as the risk of compounding errors, formulation stability, and limited clinical evidence, which demand pharmacists' knowledge and skills to ensure the quality and safety of the medications (Topelius *et al.*, 2024). The main challenges include limited guidelines, resources, and supporting research, thereby requiring further regulation and education to ensure that compounding can provide optimal benefits for pediatric patients (Dika & Riswanto, 2023).

Compounded prescriptions in the form of powders and capsules are the most commonly used solid preparations; however, tablet crushing for this purpose often leads to problems such as dose loss, particle non-uniformity, and the destruction of special formulations that should not be crushed, which may reduce effectiveness or increase toxicity. This condition highlights the need for standardized procedures and education for healthcare professionals to ensure compounded preparations remain safe and accurately dosed (Blaszczyk *et al.*, 2023). Errors in compounding practices have been identified in approximately 3% of the reports analyzed. Although this percentage may seem small, such errors have the potential to cause serious impacts on patient safety, particularly due to dose inaccuracies or inappropriate dosage forms. These findings highlight the importance of implementing standardized procedures, quality validation, and pharmacist involvement in the compounding process to minimize risks and ensure therapeutic safety (Carvalho & Almeida, 2022). Although compounding is a crucial solution for individual therapeutic needs, such as dose adjustments or preparations not commercially available, the practice remains safe and valuable when all potential errors are anticipated and prevented through strict adherence to compounding guidelines, such as Good Compounding Practice (GCP), Compliance Policy Guide, or national standards. Implementing this regulatory framework ensures that the compounding process in pharmacies is conducted optimally, safely, and in accordance with pharmaceutical service regulations (Bello *et al.*, 2025).

Compounding has become a common practice in pharmacies, especially when commercially available drug preparations are unavailable or need to be tailored to patient needs. This study found various antidepressant compounds being prepared in pharmacies; however, the compounding practice still heavily relies on pharmacists' experience and does not fully adhere to standardized guidelines. This aligns with the situation in Indonesia, where pharmacies serve as the primary source for

medications, including compounded drugs, although specific regulations regarding compounding practices remain limited, potentially leading to variations in the quality and safety of preparations (Christin & Putri, 2023).

In many developed countries, good compounding practices have been standardized through Good Compounding Practice (GCP) as outlined in USP General Chapter <795>, and these guidelines have been widely adopted internationally. For example, during the 2024 USP Implementation Workshop organized by the United States Pharmacopeia, experts from various countries such as Brazil, the United Kingdom, Spain, Germany, and the Netherlands discussed local adoption patterns of USP <795> and <797> standards, including regulatory challenges, technological requirements, and the need for global harmonization to ensure the quality and safety of compounding (Pierce, 2024). From an initial survey conducted in several pharmacies in the Lamongan area, the researchers obtained information that these pharmacies handle non-sterile compounded prescriptions on a daily basis. After contacting the pharmacy staff and presenting the initial survey letter, it was found that some personnel were still unfamiliar with the term “compounding” and had limited understanding of the concept. This prompted the researchers to further explore the pharmacy staff’s knowledge regarding Good Compounding Practice (GCP). Based on the results of the initial survey, a more in-depth study was conducted on the Overview of Pharmacy Staff’s Knowledge Level Regarding Good Compounding Practice in Pharmacies in the Lamongan Area.

## **Methodology**

This quantitative descriptive study employed a cross-sectional design and was conducted in community pharmacies across Lamongan Regency, Indonesia, between November 2023 and April 2024. The study population consisted of 85 pharmaceutical personnel, including 26 pharmacists and 59 pharmacy technicians. Respondents were selected using simple random sampling, resulting in a final sample of 70 participants. Eligible participants were pharmaceutical personnel (pharmacists or pharmacy technicians) who were actively involved in pharmacy services, had worked at the pharmacy for at least six months, and agreed to participate by providing written informed consent. Personnel who were on leave during the data collection period, were not directly involved in compounding or dispensing activities, or returned incomplete questionnaires were excluded from the study.

Data were collected using a structured self-administered questionnaire developed based on the compounding standards described in USP 34 Chapter <795>. The original questionnaire was translated into Indonesian using a forward–backward translation procedure to ensure semantic equivalence. Prior to the main survey, the Indonesian version was pilot-tested among pharmaceutical personnel from pharmacies outside the study area to evaluate its psychometric properties. Content validity was assessed by a panel of experts in pharmacy practice, while construct validity was examined using item-total correlation analysis. Internal consistency reliability was evaluated using Cronbach's alpha, and the questionnaire demonstrated acceptable validity and reliability for use in the present study.

The final questionnaire consisted of three sections: informed consent, respondent characteristics, and 15 multiple-choice questions assessing knowledge of Good Compounding Practice. Each correct response received one point, whereas

incorrect responses received zero points. Knowledge scores were converted into percentages and categorized as good (76–100%), moderate (56–75%), or poor (<56%). Data were analyzed descriptively using Microsoft Excel to summarize respondents' demographic characteristics and knowledge levels.

## Result and Discussion

**Table 1. Distribution of Respondents' Characteristics Based on Gender at Pharmacies in Lamongan District.**

| Gender       | n         | %          |
|--------------|-----------|------------|
| Male         | 11        | 16         |
| Female       | 59        | 84         |
| <b>Total</b> | <b>70</b> | <b>100</b> |

From the first respondent characteristic, namely gender, the majority of respondents were female, totaling 59 people (84%), while male respondents amounted to 11 people (16%). This finding is consistent with a study conducted by (Mizranita *et al.*, 2021) which involved 327 respondents consisting of 185 pharmacists and 142 pharmacy technicians, showing that both professions were dominated by females. The demographic analysis revealed that 87.0% of pharmacists were female compared to 13.0% male, while among pharmacy technicians, 85.9% were female and 14.1% were male. The pharmacy profession is increasingly dominated by women, influenced by the growing number of female pharmacy students, job flexibility, and part-time opportunities that support work-life balance (Bissell *et al.*, 2021).

**Table 2. Distribution of Respondents' Characteristics Based on Age at Pharmacies in Lamongan District.**

| Age          | n         | %          |
|--------------|-----------|------------|
| 17 - 25      | 24        | 34         |
| 26 - 35      | 32        | 46         |
| 36 - 45      | 11        | 16         |
| 46 - 55      | 3         | 4          |
| <b>Total</b> | <b>70</b> | <b>100</b> |

According to the Ministry of Health of the Republic of Indonesia (2009), the classification of age groups is as follows: late adolescence (17–25 years), early adulthood (26–35 years), early elderly (36–45 years), and late elderly (46–55 years). Based on age characteristics, the majority of respondents were in the 26–35 years age group, totaling 32 people (46%). This was followed by the 17–25 years group with 24 people (34%), the 36–45 years group with 11 people (16%), and the smallest proportion from the 46–55 years group with 3 people (4%). (Mill *et al.*, 2021) reported that the 25–34 years age group dominated registered pharmacists,

accounting for 46.5% of total respondents. At this stage, they have recently completed professional education and begun to establish career stability. This age range is considered an optimal productive period, characterized by high energy and adaptability, along with sufficient work experience, which supports greater retention in the field (Almaghaslah, 2023).

**Table 3. Distribution of Respondents' Characteristics Based on Educational Background at Pharmacies in Lamongan District.**

| <b>Educational Background</b> | <b>n</b>  | <b>%</b>   |
|-------------------------------|-----------|------------|
| Pharmacist                    | 21        | 30         |
| Diploma III                   | 49        | 70         |
| <b>Total</b>                  | <b>70</b> | <b>100</b> |

It was found that the majority of pharmaceutical personnel held a Diploma III degree (70%), while a smaller proportion were pharmacists (30%). (Meilianti *et al.*, 2022) reported that out of a total of 202,182 pharmaceutical personnel, 149,809 (74.1%) were pharmacy technicians with a Diploma III background, whereas only 52,373 (25.9%) were pharmacists. This indicates that pharmaceutical services in Indonesia are still largely dominated by pharmacy technicians, particularly in primary healthcare facilities and community pharmacies. (Sukri *et al.*, 2024) stated that education has a significant relationship with health knowledge levels. Research in Indonesia has demonstrated that the higher the level of formal education, the better the respondents' knowledge.

**Table 4. Distribution of Respondents' Characteristics Based on Years of Service at Pharmacies in Lamongan District.**

| <b>Years of Service</b> | <b>n</b>  | <b>%</b>   |
|-------------------------|-----------|------------|
| < 1                     | 6         | 9          |
| 2-5                     | 43        | 61         |
| > 6                     | 21        | 30         |
| <b>Total</b>            | <b>70</b> | <b>100</b> |

Almost the majority of respondents had been working for 2 to 5 years or more (61%), followed by less than 1 year (9%), and more than 6 years (30%). (Almaghaslah & Alsayari, 2023) reported that the majority of respondents had relatively short work experience, with 62.4% having less than 5 years of service. This finding reinforces that most pharmaceutical personnel are still in the early stages of their careers, particularly within the 3–5 years range of work experience. According to (Ilham, 2022) length of service is a measure of time spent by individuals in understanding and performing their job tasks, thereby reflecting their work ability acquired through continuous experience. (Irawati *et al.*, 2017) stated that work experience has a positive and significant effect on employee performance, where the longer the service period, the higher the quality of work produced.

**Table 5. Distribution of Respondents Based on Knowledge of Good Compounding Practice at Pharmacies in Lamongan District in 2024.**

| Criteria     | Amount    | Percentage (%) |
|--------------|-----------|----------------|
| Good         | 58        | 83             |
| Fair         | 7         | 10             |
| Poor         | 5         | 7              |
| <b>Total</b> | <b>70</b> | <b>100</b>     |

Respondents' knowledge of drug compounding (Good Compounding Practice) was mostly good (83%), moderate (10%), and poor (7%). Out of 70 respondents, 58 had good knowledge, 10 had moderate knowledge, and 5 had poor knowledge. This finding is consistent with a study conducted by (Arrang *et al.*, 2022) which reported that more than 80%, precisely 93.7%, of pharmacists in Indonesia possessed knowledge of Beyond-Use Date (BUD) in non-sterile compounding practice, indicating a very high level of understanding. Knowledge of good compounding is essential to ensure the quality, safety, and effectiveness of compounded preparations, as well as to prevent errors such as microbial contamination, dosing mistakes, the use of inappropriate ingredients, and contaminated compounded medications (Carvalho & Almeida, 2022).

One of the most important findings of this study was that knowledge regarding Beyond-Use Date (BUD) was the lowest among all Good Compounding Practice domains (52%). This finding has important clinical implications because BUD determines the period during which a compounded preparation remains safe, stable, and effective after preparation. Unlike the manufacturer's expiration date, BUD is assigned based on formulation characteristics, storage conditions, and available stability data (United States Pharmacopeia [USP] <795>, 2023). Inadequate knowledge of BUD may result in inappropriate labeling, reduced drug potency, chemical degradation, microbial contamination, and increased risk of treatment failure or adverse events, particularly in vulnerable populations such as pediatric and geriatric patients who frequently require compounded medications (Pierce, 2024)(Meida & Octavia, 2022)(Wijaya & Octavia, 2024).

The low level of BUD knowledge indicates a need to strengthen the competency of pharmaceutical personnel in compounding practices. Continuous professional development through regular training and workshops organized by the Indonesian Pharmacists Association (IAI) and the Indonesian Pharmacy Technician Association (PAFI), particularly on stability assessment and BUD determination based on USP <795>, should be prioritized. These educational initiatives should be complemented by standardized operating procedures, periodic competency evaluations, and routine practice audits to improve compliance with Good Compounding Practice and enhance the quality and safety of compounded medications in community pharmacies (Al Shammari *et al.*, 2021).

Respondents with poor knowledge totaled 5 people (7%), the majority of whom were male, aged 17–25 years, with less than 1 year of work experience. The study by (Athiyah *et al.*, 2019) demonstrated that work experience and age are

significant factors influencing pharmacists' knowledge and practice in pharmacies. Pharmacists with less than 1 year of experience tended to have lower knowledge, as observed in the 5 respondents (7%) in this study. These findings are consistent with the theory that work experience affects the ability to understand and apply pharmaceutical procedures, including Good Compounding Practice. Moreover, this study emphasizes the importance of standard operating procedures (SOPs) to support the quality of pharmaceutical services and enhance pharmacists' knowledge.

Most respondents had good knowledge of drug compounding (83%/58 respondents), while 10% (7 respondents) had moderate knowledge and 7% (5 respondents) had poor knowledge. According to (Rusmawantia *et al.*, 2025) 71.95% of pharmaceutical personnel demonstrated good knowledge related to Good Compounding Practice (GCP), while the implementation aspect reached 82.92% in the good category. These findings indicate that the majority of pharmacy respondents have understood the principles of proper compounding with a percentage close to 80%, suggesting that both knowledge and practice of GCP in pharmacy settings are within the good category. A good understanding of GCP is crucial for pharmaceutical personnel as it helps prevent compounding errors, contamination, and serious consequences such as antimicrobial resistance. (Davis & Ayars, 2021) reported that improper compounding practices could increase the risk of antimicrobial resistance, thereby requiring pharmacists to possess adequate knowledge and skills in applying GCP to ensure the quality and safety of compounded medications.

**Table 6. Distribution of the Percentage of Correct Answers from Respondents at Pharmacies in Lamongan District in 2024.**

| Knowledge Indicator           | n  | %  | Knowledge Category |
|-------------------------------|----|----|--------------------|
| Definition of Compounding     | 68 | 97 | Good               |
| Purpose Of Compounding        | 60 | 86 | Good               |
| Compounding Proses            | 57 | 82 | Good               |
| Aspects Of <i>Compounding</i> | 53 | 75 | Fair               |

Based on the indicator of understanding compounding, 68 respondents (97%) answered correctly, while 2 respondents (3%) answered incorrectly. According to an inter-institutional survey among AACP members, although 100% of respondents agreed that compounding education should be included in the curriculum, 21% were unable to provide a written definition of compounding, indicating persistent conceptual ambiguity among pharmacy educators regarding the fundamental meaning of compounding (Shrewsbury *et al.*, 2012) Knowledge of Good Compounding Practice (GCP) is crucial for pharmaceutical personnel as it ensures the quality of compounded medicines and prevents serious clinical consequences. (Assefa *et al.*, 2022) reported that 86% of respondents indicated that non-standard compounding practices could increase the risk of antimicrobial resistance, highlighting the necessity of a solid understanding of GCP to safeguard patient and public safety.

The compounding purpose indicator showed that 60 respondents (86%) answered correctly, while 10 respondents (14%) answered incorrectly. In line with the study by (Assefa *et al.*, 2022) most pharmaceutical personnel understood the

purpose of compounding, with 77.7% of respondents stating that compounding was performed when a drug was unavailable on the market and 72.3% when the required dose was not available in manufactured preparations. According to (Macarthur *et al.*, 2022) compounding plays an essential role in pediatrics by adjusting dosages and dosage forms to make them more acceptable to patients, thereby improving treatment adherence.

The compounding process indicator consisted of five questions, with the respondents' average knowledge score of 82% (57 correct answers). The highest score was observed in the compounding criteria indicator (90%, with 58 respondents (97%) answering correctly), namely preparing one prescription at a time. Meanwhile, the lowest score appeared in the process from prescription receipt to drug preparation (53%). (N. A. Putri *et al.*, 2025) emphasized that preparing one prescription sequentially is a crucial step to prevent cross-contamination, as outlined in the Good Compounding Practice guidelines (USP, 2022) in compounding practice.

In the lowest compounding process indicator, most respondents had limited understanding of the concept from prescription receipt to drug preparation. This contrasts with the study by (Wang & Chan, 2023) which reported that the majority of respondents understood that the dispensing process includes steps from prescription receipt to drug delivery, with a comprehension rate of 86%, confirming the alignment of dispensing definitions with the practice from prescription receipt to preparation. Knowledge of the dispensing process among pharmaceutical personnel is crucial to prevent medication errors such as incorrect instructions, insufficient drug quantities, or incomplete labeling. This is consistent with the findings of (Ibrahim *et al.*, 2020) who reported that the most frequent dispensing errors were incomplete instructions (40.9%) and incorrect drug delivery (4.1%), both of which pose potential risks to patient safety.

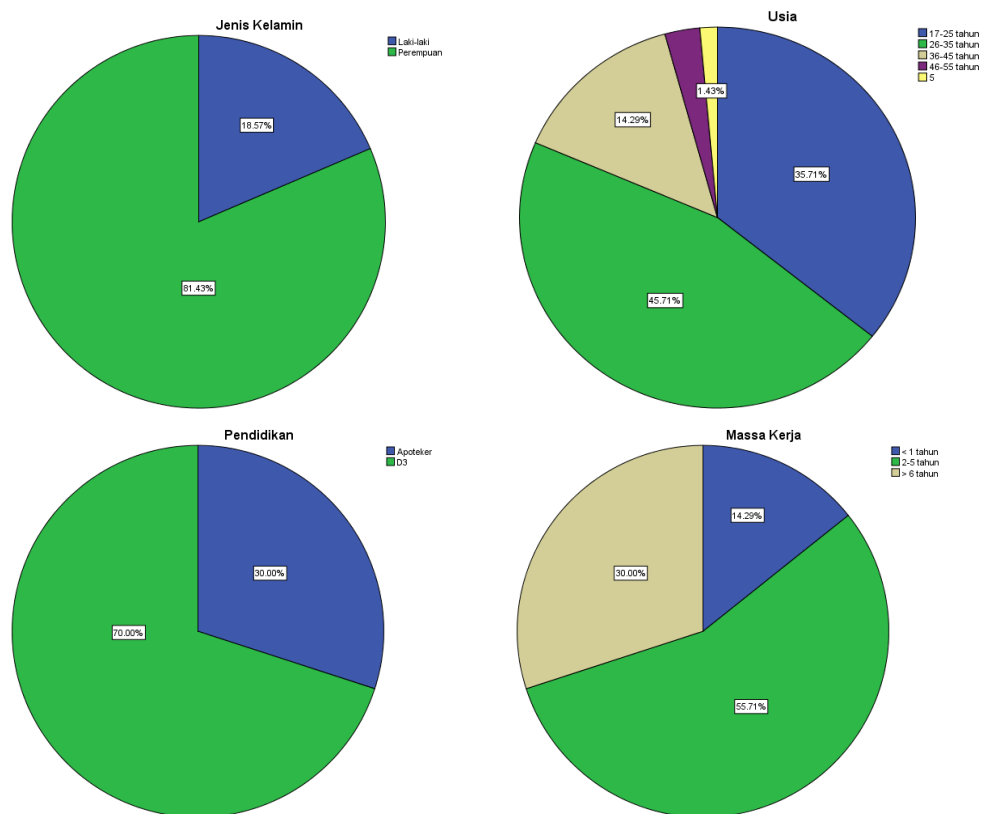
The compounding aspect indicator covered eight categories, with the highest score in the personnel category (92%, 65 respondents) and the lowest in the stability category. Findings from (Gentry, 2021) showed that 72.6% of respondents were pharmacists actively involved in the compounding process, supporting the statement that most compounding activities are carried out by trained pharmaceutical personnel. In accordance with the statement that personnel managing drug compounding must be certified pharmaceutical staff, a study by (Alkhatib *et al.*, 2019) in Jordan showed that 93% of the staff involved in compounding were pharmacists, while only 6.5% were registered pharmacy assistants. This finding reinforces that compounding tasks should be carried out by personnel who meet the professional competency standards in pharmacy.

The lowest category in the compounding aspect was stability, where only 36 respondents (52%) knew that the Beyond-Use Date (BUD) of oral preparations containing water should not exceed the specified limit. This finding is consistent with (Nurbaety *et al.*, 2023) who reported that only 42.9% of pharmacy students had good knowledge regarding BUD, particularly for water-containing oral preparations. Similarly, (Karuniawati *et al.*, 2024) found that 75–77% of pharmacists in Sukoharjo actively calculated BUD and included it on the compounded drug labels, while around 80% provided verbal BUD information to patients. However, only 65% ensured that

patients fully understood this information. These findings emphasize that both knowledge and communication regarding BUD are critical responsibilities of pharmaceutical personnel to guarantee the quality, safety, and effectiveness of compounded medications.

In addition to knowledge of Beyond-Use Date (BUD), pharmaceutical personnel must also understand the proper compounding process to ensure the availability of high-quality, safe, and effective medications in accordance with therapeutic goals. Compounding represents an essential component of pharmaceutical services in community pharmacies, aimed at enhancing the quality of care and ensuring that medications delivered to patients maintain their quality, efficacy, and safety.

Research by (Rusmawantia *et al.*, 2025) revealed that the understanding and implementation of *Good Compounding Practice* (GCP) in community pharmacies are influenced by internal factors such as education and work experience, as well as external factors such as the availability of practice guidelines, facilities, and training. This emphasizes that both types of factors play an important role in mastering the compounding process. Based on Figure 1, the factor that most influenced respondents' knowledge level in this study was the internal factor. Of the 70 respondents, the majority with good knowledge were female (81.3%), aged 26–35 years (46%), with 2–5 years of work experience (45%), and holding a diploma degree (D3) as their latest education (60%).



**Figure 1. Distribution of Percentage of Factors Affecting Respondents' Knowledge**

Based on Figure 1, out of 70 respondents, the factors influencing the level of knowledge were female gender (81.3%), respondents aged 26–35 years (46%), work experience of 2–5 years (45%), and the last education level of Diploma 3 (60%).

**Conclusion**

Based on the results of this study, it can be concluded that out of 70 pharmaceutical personnel working in pharmacies in Lamongan in 2024, the majority had good knowledge of drug compounding (Good Compounding Practice), with 58 respondents (83%). Meanwhile, 10 respondents (10%) had moderate knowledge, and 5 respondents (7%) had poor knowledge. These findings highlight the importance of expanding literature and information related to Good Compounding Practice in pharmaceutical services to support the quality of healthcare delivery.

**Declaration of Competing Interest**

The authors declare that there are no personal, financial, or commercial interests that could affect the outcomes of this study. This research was carried out independently and objectively, without any sponsorship, company involvement, or other external parties that might introduce bias into the findings.

**Reference**

- Al Shammari, Y. H., Al Shammari, H. A., Barak, T. M. Bin, Alharbi, B. S., Alshammari, S. T., Alnais, S. A., Aljohani, S. A., Alorf, A. A., Alnawmasi, M. A., Alshammari, M. A., Alharbi, M. F., Al Enazi, A. G., & Alamri, A. M. M. (2021). Pharmaceutical compounding: Techniques and applications. *International Journal of Health Sciences*, 5, 926–939. <https://doi.org/10.53730/ijhs.v5ns1.14839>
- Alkhatib, H. S., Jalouqa, S., Maraqa, N., Ratka, A., Elayeh, E., & Muhaisen, S. Al. (2019). *Prevalence , determinants , and characteristics of extemporaneous compounding in Jordanian pharmacies*. 1–9.
- Almaghaslah, D. (2023). An analysis of pharmacy workforce capacity in Saudi Arabia. *Frontiers in Pharmacology*, 14(August), 1–7. <https://doi.org/10.3389/fphar.2023.1219528>
- Almaghaslah, D., & Alsayari, A. (2023). A cross-sectional study on Saudi pharmacists working as medical representatives: What attracted them and what is keeping them in this sector—Misconceptions and reality. *Frontiers in Public Health*, 11(1). <https://doi.org/10.3389/fpubh.2023.996536>
- Arrang, S. T., Chiara, M. A., & Hendra, O. S. (2022). *Prevalence of pharmacist knowledge on beyond-use date ( BUD ) of various non-sterile compounding drugs in Indonesia*. 20(1), 1–4. <https://doi.org/10.18549/PharmPract.2021.1.2630>
- Assefa, D., Paulos, G., Kebebe, D., Alemu, S., Reta, W., Mulugeta, T., & Gashe, F. (2022). Investigating the knowledge, perception, and practice of healthcare practitioners toward rational use of compounded medications and its contribution to antimicrobial resistance: a cross-sectional study. *BMC Health Services Research*, 22(1), 1–7.

<https://doi.org/10.1186/s12913-022-07649-4>

Athiyah, U., Setiawan, C. D., Nugraheni, G., Zairina, E., Utami, W., & Hermansyah, A. (2019). Assessment of pharmacists' knowledge, attitude and practice in chain community pharmacies towards their current function and performance in Indonesia. *Pharmacy Practice*, 17(3), 1–7. <https://doi.org/10.18549/PharmPract.2019.3.1518>

Bello, W., Pezzatti, J., Stampfli, C., Carrez, L., & Rudaz, S. (2025). *A critical opinion-based review of hospital pharmacy compounding with respect to the risk of leachaable substances due to the off- label use of plastic primary packaging*. 1–28. <https://doi.org/10.1177/https>

Bissell, B. D., Johnston, J. P., Smith, R. R., Newsome, A. S., Thompson Bastin, M. L., Abdul-Mutakabbir, J., Barlow, A., Barlow, B., Berger, K., Crow, J. R., Dixit, D., Jacobi, J., Karaoui, L. R., Kiser, T. H., Kolesar, J., Koontz, S. E., Mattingly, T. J., Mitchell, C., Nilges, A., ... Heavner, M. S. (2021). Gender inequity and sexual harassment in the pharmacy profession: Evidence and call to action. *American Journal of Health-System Pharmacy*, 78(22), 2059–2076. <https://doi.org/10.1093/ajhp/zxab275>

Blaszczyk, A., Brandt, N., Ashley, J., Tuders, N., Doles, H., & Stefanacci, R. G. (2023). Crushed Tablet Administration for Patients with Dysphagia and Enteral Feeding: Challenges and Considerations. *Drugs and Aging*, 40(10), 895–907. <https://doi.org/10.1007/s40266-023-01056-y>

Carvalho, M., & Almeida, I. F. (2022). The Role of Pharmaceutical Compounding in Promoting Medication Adherence. *Pharmaceuticals*, 15(9). <https://doi.org/10.3390/ph15091091>

Christin, D., & Putri, A. (2023). *Profil persepahan dan analisis risiko racikan antidepresan di sebuah apotek di Yogyakarta*. 7(1), 62–71. <https://doi.org/10.32504/hspj.v7i2.803>

Davis, J., & Ayars, C. (2021). Retention of Sterile Compounding Knowledge Among Pharmacy Technicians. *Journal of Pharmacy Technology*, 37(5), 219–224. <https://doi.org/10.1177/87551225211032395>

Dika, F., & Riswanto, O. (2023). *Prevalence , Risk , and Challenges of Extemporaneous Preparation for Pediatric Patients in Developing Nations: A Review*. <https://doi.org/10.46542/pe.2021.212.9397>

Gentry, L. (2021). *2021 National Pharmacy Compounding Demographics Study by*. Ibrahim, O. M., Ibrahim, R. M., Meslamani, A. Z. A. L., & Mazrouei, N. A. L. (2020). *Dispensing errors in community pharmacies in the United Arab Emirates : investigating incidence , types , severity , and causes*. 18(4), 1–8.

Ilham, M. (2022). Peran Pengalaman Kerja Dalam Meningkatkan Kinerja Karyawan: Suatu Tinjauan Teoritis Dan Empiris. *Jmm Unram - Master of Management Journal*, 11(1), 13–20. <https://doi.org/10.29303/jmm.v11i1.695>

Irawati, Anwar, Ruma, Haeruddin, M. I. M., & Dipoatmodjo, T. S. . (2017). Pengaruh Implementasi Fungsi Manajemen Terhadap Kinerja Instansi Perspektif Ekonomi Islam. *Jurnal Manajemen*, 14(4), 2022–2715.

Karuniawati, H., Rosa, M., & Hi, S. (2024). *Original Article Evaluation Of The Determination And Implementation Of Beyond-Use Date ( BUD ) To Non-Sterile Extemporaneous Compounded Medicines By Pharmacist In Sukoharjo Indonesia*. 16(6), 1–6.

Macarthur, R. B., Ashworth, L. D., Zhan, K., & Ii, R. H. P. (2022). *How Compounding Pharmacies Fill Critical Gaps in Pediatric Drug Development Processes : Suggested Regulatory Changes to Meet Future Challenges*.

Meida, B., & Octavia, D. R. (2022). *Edukasi BUD pada pasien Instalasi Farmasi Rumah Sakit dr . Koesma Tuban Jawa Timur .* 5636(1), 55–61.

Meilianti, S., Smith, F., Kristianto, F., Himawan, R., Ernawati, D. K., Naya, R., & Bates, I. (2022). A national analysis of the pharmacy workforce in Indonesia. *Human Resources for Health*, 20(1), 1–12. <https://doi.org/10.1186/s12960-022-00767-4>

Mill, D., Johnson, J. L., Lee, K., Salter, S. M., D’Lima, D., Seubert, L., Clifford, R., & Page, A. T. (2021). Use of professional practice guidance resources in pharmacy: a cross-sectional nationwide survey of pharmacists, intern pharmacists, and pharmacy students. *Journal of Pharmaceutical Policy and Practice*, 14(1), 1–19. <https://doi.org/10.1186/s40545-021-00395-8>

Mizranita, V., Sim, T. F., Sunderland, B., Parsons, R., & Hughes, J. D. (2021). Pharmacists’ and pharmacy technicians’ scopes of practice in the management of minor ailments at community pharmacies in indonesia: A cross-sectional study. *Pharmacy Practice*, 19(2), 2295–2295. <https://doi.org/10.18549/PharmPract.2021.2.2295>

Nurbaety, B., Rahmawati, C., Lenysia, B., Anjani, P., Nopitasari, B. L., & Monika, D. (2023). *IAI SPECIAL EDITION Pharmacy student knowledge level regarding the beyond-use date*. 23, 60–64.

Pierce, G. (2024). *Advancing Pharmacy Practice : 13*(6).

Putri, D. C. A., Nanga, M. D. K., & Yuliani, S. H. (2021). The evaluation of compounding prescription and its availability of a licensed product for children at a private hospital in Yogyakarta, Indonesia. *Pharmacy Education*, 21(2), 93–97. <https://doi.org/10.46542/pe.2021.212.9397>

Putri, N. A., Wijaya, H., Sukawaty, Y., & Mubarak, A. Al. (2025). *Analysis of Pharmacists ’ Knowledge Level on Good Compounding Practice ( GCP ) in Pharmacies of Tenggara and Tenggara Seberang Subdistricts*. 9(June), 1–8.

Rusmawantia, D. A., Wijaya, H., Citraningtyas, G., & Al-Mubarak, A. (2025). Pharmacists’ Knowledge of Non-Sterile Good Compounding Practice (GCP) and Its Implementation in Balikpapan Community Health Centers: A Cross-Sectional Study. *Malaysian Journal of Medical Research*, 09(01), 11–21. <https://doi.org/10.31674/mjmr.2025.v09i01.002>

Shrewsbury, R., Augustine, S., Birnie, C., Nagel, K., Ray, D., Ruble, J., Scolaro, K., & Adams, J. A. (2012). Assessment and recommendations of compounding education

in AACP member institutions. *American Journal of Pharmaceutical Education*, 76(7).  
<https://doi.org/10.5688/ajpe767S9>

Sriwijaya, R. A., Nurleni, N., & Bella, I. (2022). Description of Pharmaceutical Services and Levels of Patient Satisfaction with Services at Two Pharmacies in Lahat District. *Asian Journal of Healthcare Analytics*, 1(2), 133–150.  
<https://doi.org/10.55927/ajha.v1i2.1963>

Sukri, S., Palinggi, Y., Taliabo, P., & Lisma, L. (2024). Pengaruh Pendidikan Kesehatan Terhadap Tingkat Pengetahuan Tentang Pencegahan Hipertensi. *Jurnal Promotif Preventif*, 7(1), 52–57. <https://doi.org/10.47650/jpp.v7i1.1089>

Topelius, N. S., Shokraneh, F., Bahman, M., Lahtinen, J., Hassinen, N., Airaksinen, S., Verma, S., Hrizanovska, L., Lass, J., Paaver, U., Tähnas, J., Kern, C., Lagarce, F., Fenske, D., Malik, J., Scherliess, H., & Cruz, S. P. (2024). *Automated Non-Sterile Pharmacy Compounding : A Multi-Site Study in European Hospital and Community Pharmacies with Pediatric Immediate Release Propranolol Hydrochloride Tablets*.  
<https://doi.org/10.1016/j.coph.2021.12.008>

Wang, Y., & Chan, H. (2023). *A Qualitative Approach to Exploring Workflow and Cost Factors of Dispensing Services in Community Pharmacies in Taiwan*. October, 3179–3188.

Wijaya, H., & Octavia, D. R. (2024). *Analysis of Pharmacists ' Knowledge of Non-Sterile Good Compounding Practice ( GCP ) and Implementation in Samarinda City Pharmacies*. 8(July), 7–13.