Healthcare collaboration intervention: Pre-post study

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Abstract

Background: Effective interprofessional collaboration between health professionals is correlated with improving the quality of health services and patient safety, for example, Program Pengendalian Resistensi Antibiotik (PPRA). **Objective:** This research aims to determine the effect of educational PPRA on the knowledge and motivation of healthcare professionals in interprofessional collaboration practices. **Methods:** The research is quasi-experimental, with one group pre-post using a knowledge questionnaire (questionnaire 1) and a motivation questionnaire (questionnaire 2). The respondents were health professionals at Husada Utama Hospital. This research involved 74 respondents: two doctors, three pharmacists, 41 nurses, five midwives, ten pharmacist assistants, and 13 laboratory assistants. **Results:** The analysis of the effect of providing education on health professionals' knowledge level showed a significant improvement in good categories before and after education, with 55.4% before and 73% after (Sig. = 0.025, *p* < 0.05). The analysis of the level of motivation showed that moderate categories grew insignificantly before and after education, with 39.19% before and 47.30% after (Sig = 0.599, *p* > 0.05). **Conclusion:** This research concluded that PPRA education's effect on health workers' knowledge and motivation in interprofessional collaboration at Husada Utama Hospital has increased knowledge and motivation.

Introduction

Antibiotic resistance is a global issue causing an increase in mortality, with Asia and Africa having the highest rates (World Health Organization, 2021). The Indonesian government supports the Global Action Plan, which includes the Antimicrobial Stewardship (AMS) initiative through Permenkes No. 8 of 2015.

The Antimicrobial Stewardship (AMS) policies in Asia have positive impacts, including reduced clinical deterioration scores, length of stay, mortality, and re-admission rates, while also reducing the discovery of resistant microorganisms (Setiawan *et al.,* 2019). In Beijing Chaoyang, China, the use of antibiotics also decreased in the outpatient ward, going from 19.28% to 13.21%, while inpatient wards decreased from 64.34% to 34.65% (Wang *et al.,* 2019). In Indonesia, a rational implementation of antibiotic use was undergone, moving from 31.25% to 62.5%, and total antibiotic use per 100 patients per day decreased from a defined daily dose of 90.84% to 61.42% (Karuniawati *et al.,* 2021).

According to studies, interprofessional collaboration (IPC) decreases antibiotic use by 12.2% between 2015 and 2019 (Schmid *et al.,* 2022). Furthermore, collaboration with the Neonatal Intensive Care Unit (NICU) staff resulted in a 34% reduction in relative risk of median antibiotic use rate (Dukhovny *et al.,* 2019).

The capability, opportunity, motivation behavioural theory (COM-B) method helps healthcare practitioners understand and motivate successful IPC. Motivation is driven by capacity and opportunity, affecting knowledge, skills, and abilities. However, a knowledge and education gap across professions and behavioural treatments is needed for optimal collaboration (Michie, 2015).

The research shows education enhances healthcare workers' clinical pathway knowledge, AMS comprehension, and teamwork.

Limited intervention studies in Indonesia have examined antibiotic resistance reduction in interprofessional collaborative healthcare practices (IPC); IPC is crucial for effective management and prevention.

Methods

Design

This study investigates the impact of Program Pengendalian Resistensi Antibiotik (PPRA) education on health professionals' knowledge and motivation at Husada Utama Hospital Surabaya. A one-group pre-test post-test design was used to collect primary data, using a knowledge level questionnaire (questionnaire 1) and a motivation level questionnaire (questionnaire 2). The knowledge and belief questionnaire measures healthcare knowledge, while the self-evaluation capability, opportunity, and motivation (COM) questionnaire assesses motivation.

The educational implementation is packaged in the form of a one-hour seminar entitled "*Interprofessional collaboration practice in controlling antimicrobial-drug resistance in hospital*," delivered by the Chairman of the Medical Committee at Husada Utama Hospital. The seminar covers four discussion topics: PPRA implementation, antibiotic resistance, antibiotic rationalisation, and interprofessional collaborative practices.

Instrument

This study uses total sampling to select healthcare personnel from Hospital Husada Utama Surabaya who attended the PPRA educational seminar on December 19th-20th, 2022. Data collection uses Google Forms, with inclusion criteria including informed consent, comprehensive questionnaire completion, and full participation.

Data analysis

Questionnaire development

The study questionnaire was developed following comprehensive literature. Judgement from a clinical pharmacy and psychology lecturer was given, reviewing the questionnaire for structure and content validity to assess the constructed questionnaire's clarity, understandability and organisation. The knowledge questionnaire was adopted by the Knowledge and Belief Questionnaire (KR-20 = 0.54) (Herawati *et al.,* 2022) and the motivation questionnaire was adopted by the COM self-evaluation 6-item questionnaire (ICC = 0.83, ICC>0.75) (Keyworth *et al.,* 2020). There were 74 respondents in total, and this was used to establish the questionnaire's face validity. Thereafter, every item on the questionnaire will be used as a tool for education assessment.

A high correlation coefficient indicates a good questionnaire's construct validity. Data is valid when the *r* count is greater than the *r* table. The study used internal consistency tests with KR-20 for Questionnaire 1 and Cronbach's alpha coefficient values > 0.7 for Questionnaire 2.

Questionnaire scoring

Questionnaire 1 has 12 questions. Each successful answer receives a score of one, while each erroneous response receives a zero: the maximum score is 12. The domain knowledge score is categorised into good, sufficient, and bad categories. While the percentage of accurate responses used to assess domain knowledge is divided into three categories: good categorisation (mean > 76 - 100%), sufficient categorisation (mean = 60 - 76%), and bad categorisation (mean < 60%).

Questionnaire 2 assesses instinctive and reflective motivation using a Likert scale with four statements. The questionnaire was created using a Likert scale in the form of a statement with four response options (4 = "*strongly agree*", 3 = "*agree*", 2 = "*disagree*", and 1 = "*strongly disagree*"). The assessment yields a score ranging from eight to thirty-two based on the scores from each subscale. The questionnaire was categorised as high, moderate, or low, with each being defined as such, with standard deviation being denoted by SD: high (x ≥ mean + 1 SD), moderate (mean + 1 SD > x > mean - 1 SD), and low (mean - 1 SD ≥ x).

Statistical analysis

Data was analysed using the IBM Statistical Package for Social Science (SPSS) version 26. Checking for normality was carried out using the Kolmogorov-Smirnov test (with $p > 0.05$ indicating a normally distributed). Wilcoxon sign rank test was used to evaluate pre-post education. A p-value of $p \leq 0.05$ was considered statistically significant for all statistical analyses, and all tests were two-tailed.

Location

The study was done in Husada Utama Hospital Surabaya (Private hospital type B with a bed capacity 288).

Ethical considerations

The ethical committee of Husada Utama Hospital, Surabaya, authorised this study under Etichal reference number 37/KEP-RSHU/XII/2022.

Results

A questionnaire was distributed before and after PPRA education implementation to assess health workers' knowledge and motivation toward interprofessional collaboration at Husada Utama Hospital.

Questionnaire validity and reliability test

The validity and reliability of knowledge and motivation questionnaires include content and construct validity tests. Content validity involves expert feedback, while construct validity uses biserial point correlation calculation. Questionnaires were considered legitimate if the r count was greater than the r table.

The validity test shows eight questionnaire items in question one and eight in question two. The validity test of questionnaire 1 found eight of 12 question items valid, while four were invalid. These four invalid questions were the following statements about increasing antibiotic resistance understanding through effective communication, education, and training; and required pre-authorised antibiotics according to clinical practice guidelines and clinical pathway. Eight legitimate questions were used instead.

The questionnaire's reliability was tested using the Kuder and Richardson Formula (KR-20) and Cronbach's alpha. Questionnaire 1 had adequate reliability (KR-20 = 0.437), while questionnaire 2 had strong reliability (Cronbach's alpha = 0.802).

Patient demographic characteristics

Respondents were predominantly female (63, 85.1%), with nurses being the most common occupation. Most had less than five years of working tenure and experienced interprofessional collaboration practices. Table I shows the data.

Table I: Characteristics of research participants

Characteristics	Total (n = 74)	Percentage (%)
Gender		
Male	11	14.9
Female	63	85.1
Age		
21-25 years old	16	21.6
26-30 years old	20	27.0
31-35 years old	19	25.7
> 35 years old	19	25.7
Profession		
Doctor	2	2.7
Pharmacist	3	4.1
Nurse	41	55.4
Midwife	5	6.8
Pharmacy assistant	10	13.5
Laboratory analyst	13	17.6
Working period		
< five years	27	36.5
Five to ten years	22	29.7
> ten years	24	32.4
Experience in collaborative practice		
Yes	61	82.4
No	13	17.6

Respondent knowledge profile

The study categorised respondents into good, sufficient, and low knowledge levels, showing significant improvement in good knowledge before and after education, with 55.4% pre-education and 73% post-education (Sig = 0.025, $p < 0.05$), as shown in Table II.

Table II: Respondent knowledge level categorisation

	Pre-education	Post-education	Chi-square
Good	41 (55.4%)	54 (73%)	
Sufficient	32 (43.2%)	17 (23%)	0.025 (significance)
Low	1 (1.6%)	3 (4.1%)	

Nursing has the highest percentage in knowledge among health workers, with a Sig. 0.000 before (254, 42.91%) and after education (263, 44.43%), as shown in Table III.

Table III: Recapitulation of knowledge levels

Health workers	Pre-education (∑ score = 592)	Post-education (∑ score = 592)	Distinction Δ	Significance
Doctor	14 (2.36%)	16 (2.70%)	2 (0.34%)	[†]0.046
Pharmacist	21 (3.55%)	22 (3.72%)	1 (0.17%)	[†]0.023
Nurse	254 (42.91%)	263 (44.43%)	9 (1.52%)	[†]0.000
Midwife	29 (4.9%)	31 (5.24%)	2 (0.34%)	[†]0.005
Pharmacy Asisstant	65 (10.98%)	70 (11.82%)	5 (0.84%)	[†]0.000
Laboratory Analyst	88 (14.86 %)	88 (14.86 %)	0 (0%)	[†]0.000

[†]$p < 0.05$; significance

Respondent motivation profile

Respondents were categorised into high, moderate, and low motivation levels. Moderate motivation grew insignificantly before and after education, with 39.19% before and 47.30% after (Sig.0.599, $p > 0.05$), as shown in Table IV.

Table IV: Respondent motivation levels categorisation

	Motivation		Chi-square significance
	Pre-education	Post-education	
High	21 (28.38%)	19 (25.68%)	
Moderate	29 (39.19%)	35 (47.30%)	0.599 (Not significant)
Low	24 (32.43%)	20 (27.03%)	

Laboratory analysts with the highest motivation increase based on profession were in the moderate category before and after education but not significantly different (Sig. 0.139, $p > 0.05$). Table V displays the findings.

Table V: Recapitulation of motivation levels

Categories	Health workers											
	Doctor		Pharmacist		Nurse		Midwife		Pharmacy assistant		Laboratory analyst	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
High	0	0	1	1	14	14	0	1	1	0	5	2
Moderate	2	2	2	2	15	16	2	2	3	4	5	10
Low	0	0	0	0	12	11	3	2	6	6	3	1
Significance	-		1		0.963		0.549		0.565		0.139	

Correlation analysis of knowledge and motivation levels

The study reveals a correlation between health professionals' knowledge and motivation before and after education, as shown above in Table VI:

1. There is a high correlation between knowledge strength and motivation before education as opposed to a weak correlation following education.

2. Positive coefficients indicate a unidirectional, linear correlation between knowledge and motivation in interprofessional collaboration practices for health workers.

3. The significance value before education is less than 0.05, indicating a significant relationship

between knowledge and motivation, while after education, the value is greater than 0.05.

Table VI: Spearman rank correlation analysis of health workers' knowledge and motivation level

Level of knowledge and motivation	Correlation coefficient	Significance (*two-tailed*)	N
Pre-education	0.408	0.000	74
Post-education	0.140	0.233	74

Discussion

Research related to knowledge and motivation for interprofessional collaboration is limited in Indonesia. One of the successes of interprofessional collaboration is understanding the role and identity of each health worker. Lack of understanding between health workers causes inequality in interprofessional collaboration (Setiadi *et al.,* 2017).

The study found a significant increase in knowledge between pre- and post-PPRA knowledge scores among health workers involved in interprofessional cooperation activities. Increased knowledge is expected to improve patient care as doctors, pharmacists, nurses, and laboratory analysts experience improved knowledge. Nurses, in particular, showed the highest percentage of knowledge compared to other health professionals.

In line with other research, it shows significant differences in perceptions between educational doctors, pharmacists, nurses, and nutritionists regarding the education level of health workers. Those with lower education tend to be less confident in their knowledge. Therefore, increasing the knowledge and training of health workers, as well as organisational support, is needed so that collaboration between health workers runs effectively (Wahyuni *et al.,* 2023).

Other research on pharmacy students (n = 40) showed that learning about interprofessional collaboration between health workers was beneficial in roles in community services but failed to reduce health workers' hierarchical ideology (Rabani *et al.,* 2021).

Patient knowledge development occurs through education conducted individually or in groups using appropriate techniques. The delivery of education affects a person's ability to improve their knowledge. The five senses impact a person's ability to absorb information, with more than one sense affecting learning. Workshops with focus group discussions are

more effective for responders, as they are more focused and practice directly (Tahoon *et al.,* 2020).

Interprofessional collaboration involves complementary knowledge and abilities in communication and decision-making. However, barriers like social disparity in position and education hinder its success. Effective communication is crucial for success, as misunderstandings can occur. Differing opinions within professional teams can lead to poor communication and lack of respect and trust (Fox *et al.,* 2021).

Motivational level scores increase interprofessional collaboration, with laboratory analysts showing the highest increase. However, the increase remained not statistically significant. Health professionals' motivation for interprofessional collaboration is low, influenced by factors like opportunity, capacity, psychological capability, physical capability, management assistance, hospital rules, age, and educational attainment. Associated degree education levels are more motivated, and laboratory analysis is the top reason for choosing a healthcare career (Ayu *et al.,* 2020).

Before education, health professionals' knowledge and motivation were strongly linked; however, the correlation was weak after education. The COM-B hypothesis suggests that knowledge impacts motivation. Opportunities, resources, organisational support, and legal restrictions regarding the environment were also shown to impact motivation. This improved psychological competence could increase motivation and improve health professionals' conduct in interprofessional cooperation activities (Michie, S & Barat, R.M., 2020).

Controlling antibiotic resistance requires knowledge of PPRA, motivation, and interprofessional collaborative practices. Clinical guide inpatient treatment, and opportunities for collaboration are related to managerial support, priorities, infrastructure, and incentives. A motivated expert is essential, and motivational assessments and interprofessional collaboration strategies such as therapeutic pathway implementation should be conducted three months after education (Jabbour *et al.,* 2018).

This research has several limitations, including some of the factors that were considered. The validation or accuracy of the motivation level questionnaire has not been seen in terms of the linearity of measuring changes in performance with the given motivation level questionnaire. In terms of the period for administering the motivation level questionnaire after education on the same day, it is best to measure the motivation questionnaire after education is given in the following days (for example, within a month) because motivation

requires a continual process of implementing educational material into practice. In terms of the characteristics of respondents, the number of respondents for each profession is disproportionate, so it does not describe the overall results at Husada Utama Hospital, and it is recommended that future research take respondents who have not been educated. Several factors influencing motivation were not researched, namely environmental influences such as hospital regulations, hospital management support, and supporting infrastructure.

Conclusion

The effect of PPRA education on health workers' knowledge and motivation in interprofessional collaboration at Husada Utama Hospital increases knowledge and motivation. Husada Utama Hospital's healthcare professionals' knowledge and motivation in interprofessional cooperation are good and moderately increase with PPRA education.

Conflict of interest

The authors declare no conflict of interest.

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References

Ayu, M., Suratri, L., Edwin, V. A., Ajeng, G., Ayu, K., Boulevard, J., Raya, B., & Gading, K. (2020). Faktor-faktor yang berhubungan dengan motivasi kerja tenaga di bidang kesehatan di rumah sakit (Risnakes 2017*). Jurnal Penelitian dan Pengembangan Pelayanan Kesehatan*, **4**(1), 23–30.

Baadani, A. M., Baig, K., Alfahad, W. A., Aldalbahi, S., & Omrani, A. S. (2015). Physicians' knowledge, perceptions, and attitudes toward antimicrobial prescribing in Riyadh, Saudi Arabia. *Saudi Medical Journal*, **36**(5), 613–619.

Dukhovny, D., Buus-Frank, M. E., Edwards, E. M., Ho, T., Morrow, K. A., Srinivasan, A., Pollock, D. A., Zupancic, J. A., Pursley, D. M., Goldmann, D., Puopolo, K. M., Soll, R. F., &

Horbar, J. D. (2019). A collaborative multicenter QI initiative to improve antibiotic stewardship in newborns. *Pediatrics*, **144**(6). https://doi.org/10.1542/peds.2019-0589

Femy Fatalina, Sunartini, Widyandana, M. S. (2015). Hubungan interprofesi perawat dengan profesi lainnya dalam mewujudkan patient safety. *Jurnal Pendidikan Kedokteran Indonesia*, **4**(1).

Herawati, F., Irawati, A. D., Viani, E., Sugianto, N. A., Rahmatin, N. L., Artika, M. P., Sahputri, S. E. B., Setiasih, Kantono, K., Yulia, R., Andrajati, R., & Soemantri, D. (2022). Effective clinical pathway improves interprofessional collaboration and reduces antibiotics prophylaxis use in orthopedic surgery in hospitals in Indonesia. *Multidisciplinary Digital Publishing Institute*, **11**(3). https://doi.org/10.3390/antibiotics11030399

Jabbour, M., Newton, A. S., Johnson, D., & Curran, J. A. (2018). Defining barriers and enablers for clinical pathway implementation in complex clinical settings. *Implementation Science*, **13**(1), 1–13.

Karuniawati, H., Yulianti, T., Aini, D. K., & Nurwienda, F. I. (2021). Impact of antimicrobial stewardship program on the use of antibiotics in pneumonia patients at a teaching hospital in Surakarta Indonesia. *International Journal of Applied Pharmaceutics*, **13**(1), 20–23.

Kementrian Kesehatan Indonesia. (2015). *Peraturan Menteri Kesehatan Republik Indonesia Nomor 8 Tahun 2015 tentang Program Pengendalian Resistensi Antimikroba di Rumah Sakit*. Permenkes No. 8 Tahun 2015 (bpk.go.id).

Keyworth, C., Epton, T., Goldthorpe, J., Calam, R., & Armitage, C. J. (2020). Acceptability, reliability, and validity of a brief measure of capabilities, opportunities, and motivations ("COM-B"). *British Journal of Health Psychology*, **25**(3), 474–501.

World Health Organization. (2019, October 22). *Antimicrobial stewardship programs in health-care facilities in low- and middle-income countries: A WHO practical toolkit*. Antimicrobial stewardship programmes in health-care facilities in low - and middle -income countries (who.int).

World Health Organization. (2021, June 9). *Global Anti Microbial Resistance and Use Surveillance System (GLASS) Report: 2021*. Global Antimicrobial Resistance and Use Surveillance System (GLASS) Report: 2021 (who.int).

Roopa, S., & Rani, M. (2012). Questionnaire designing for a survey. *Journal of Indian Orthodontic Society*, **46**(4), 273–277.

Saleh, D., Farha, R. A., & Alefishat, E. (2021). Impact of an educational intervention to promote Jordanian community pharmacists' knowledge and perception towards antimicrobial stewardship: Pre-post interventional study. *Infection and Drug Resistance*, **14**(7), 3019–3027.

Schmid, S., Schlosser, S., Gülow, K., Pavel, V., Müller, M., & Kratzer, A. (2022). Interprofessional collaboration between ICU physicians, staff nurses, and hospital pharmacists

optimizes antimicrobial treatment and improves the quality of care and economic outcomes. *Antibiotics*, **11**(381).

Setiawan, E., Wibowo, Y. I., Setiadi, A. P., Nurpatria, Y., Sosilya, H., Wardhani, D. K., Cotta, M. O., Abdul-Aziz, M.-H., & Roberts, J. (2019). Implementasi antimicrobial stewardship program di kawasan Asia: Sebuah kajian sistematis. *Indonesian Journal of Clinical Pharmacy*, **8**(2), 141–156.

Tahoon, M. A., Khalil, M. M., Hammad, E., Morad, W. S., Awad, S. M., & Ezzat, S. (2020). The effect of educational intervention on healthcare providers' knowledge, attitude, & practice towards antimicrobial stewardship program at, National Liver Institute, Egypt. *Egyptian Liver Journal*, **10**(1).

Wang, H., Wang, H., Yu, X., Zhou, H., Li, B., Chen, G., Ye, Z., Wang, Y., Cui, X., Zheng, Y., Zhao, R., Yang, H., Wang, Z., Wang, P., Yang, C., & Liu, L. (2019). Impact of antimicrobial stewardship managed by clinical pharmacists on antibiotic use and drug resistance in a Chinese hospital, 2010–2016: A retrospective observational study. BMJ Open, **9**(8), e026072.

Michie, S & West, R. M. (2020). A brief introduction to the COM-B Model of behavior and the PRIME Theory of motivation. *Qeios*, 2–7.

Fox, S., Gaboury, I., Chiocchio, F., & Vachon, B. (2021). Communication and interprofessional collaboration in primary care: From ideal to reality in practice. Health communication, **36**(2), 125–135. https://doi.org/10.1080/10410236.2019.1666499

Rabani, R., Key, M., Morrissey, H., & Ball, P.A. (2021). Exploring students' perceptions and opinions about an institutional hierarchy of healthcare professionals and its impact on their inter-professional learning outcomes. *Pharmacy Education*, **21**, 19–28. https://doi.org/10.46542/pe.2021.211.1928v

Wahyuni, K.I., Nita, Y., & Zairina, E. (2023). Perception of healthcare personnel in interprofessional collaborations: A study in two "type c" hospitals in East Java. *Pharmacy Education*, **23**(4), 344–348. https://doi.org/10.46542/pe.2023.234.344348