The Comparison of Point Prevalence Survey (PPS) and Gyssens Flowchart Approach on Antimicrobial Use Surveillance in Indonesian National Referral Hospital

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ABSTRACT

The antimicrobial resistance (AMR) rate in Indonesia is steadily rising, despite the existing national action plan in 2014. In line with the Global Action Plan on AMR, proper surveillance on antimicrobial usage and resistance are needed. At present, antimicrobial surveillance (AMS) data in Indonesia is heterogeneous, fragmented, and localized. The common method of antimicrobial surveillance (AMS) in referral hospitals is by implementing Gyssens flowchart during Antimicrobial Resistance Control Program Committee clinical rounds. However, the recent method of AMS with Point Prevalence Survey (PPS) offers many advantages include its concise and simple protocol, large data collection, shorter required time, comprehensive data outcomes, real-time data, and standardized parameters. In low-middle income countries such as Indonesia with its restricted resources in AMS, PPS is superior compared to the 'traditional' hospital clinical round in generating representative and homogenous outcomes that can be compared to data from other centers worldwide.

Keywords**:** *Antimicrobial, point prevalence survey, Gyssens flowchart, Indonesia.*

INTRODUCTION

Indonesia, the fourth most populous country in the world, underwent a rapid increase in infectious diseases and antimicrobial usage (AMU) up to 54-84%, therefore potentiating rise in antimicrobial resistance (AMR).[1–6] Despite the existing national action plan toward AMR in 2014, the AMR rate in Indonesia remained high[4,5] and caused an increase in mortality, length of hospital stays, and hence costs of hospitalization. Furthermore, the imbalance of newer antimicrobial invention was lagging

behind intense microbial mutation.[7,8]

Consistent with the 2011 Jaipur Declaration[9] which aimed to tackle AMR, in 2015, World Health Assembly adopted the Global Action Plan on Antimicrobial Resistance, which concentrated on global surveillance and research.[10] Numbers of regional surveillance programs had been undergone mostly in high-income countries (HICs), such as the Central Asian and Eastern European Surveillance of Antimicrobial Resistance (CAESAR)[11], European Point Prevalence Survey by European Centre for Disease Prevention and Control (ECDC)[12], European Antimicrobial Resistance Surveillance Network (EARS-Net)[13], and Latin American Antimicrobial Resistance Surveillance Network (ReLAVRA)[14]. Regardless of the success of data collection over years, these networks had a variety of standards for methods, data-sharing, and coordination at local and global levels. Therefore in 2015, World Health Organization (WHO) established Global Antimicrobial Resistance Surveillance System (GLASS)[15] and consequently Global Point Prevalence Survey (Global-PPS) which encompassed over 80 participating countries and more than 800 participating hospitals.[16]

Unfortunately, AMU surveillance data in Indonesia are heterogeneous, fragmented, sporadic, with most only performed by referral hospitals and did not connect to the national network.[2] This data was commonly obtained by implementing Gyssens flowchart[17], either through Antimicrobial Resistance Control Program (Program Pengendalian Resitensi Antimikroba/ PPRA) Committee clinical rounds or incidental antimicrobial audit researches.[4,18–22] The recently popular surveillance method by PPS offers a simpler method and a more thorough data collection on AMU and AMR, thus guided local and national ASP.[23,24] Overseas studies were familiar with PPS[3,12,24–26] however Indonesia had only carried out one antimicrobial surveillance research up to now.[27]

This review aims to observe the comparison of Gyssens flowchart application to PPS for AMU surveillance method in Indonesian National Referral Hospital.

METHOD OF ANTIMICROBIAL SURVEILLANCE IN INDONESIA

Regulation on Antimicrobial Resistance Control Program in Indonesia was authorized in 2015, which mainly focused on microbial resistance and antimicrobial surveillance.[28] It recommended the extraction of antimicrobial quantity data from medical or pharmacy records and quality data from antimicrobial usage form. Data was analyzed afterward using Gyssens flowchart by Antimicrobial Resistance Control Program panelists during the clinical round. Any disagreement on antimicrobial assessment will be discussed among panelists, consisted of infectious disease specialists, pharmacologists, clinical microbiologists, clinical pathologists, therapy-pharmacists, clinical pharmacists, nurses, attending physician, and Infection Prevention Control (IPC) members.[28–30]

This method of surveillance was widely implemented in referral hospitals, one of which was Cipto Mangunkusumo National Referral Hospital in Jakarta. The clinical round was usually performed weekly among all clinical departments proposing one or two complicated clinical cases. These cases were discussed for 2-3 hours by panelists who examined the quality of antimicrobial prescribing with Gyssens flowchart. The outcomes of the analysis were commonly formed as an assessment of antimicrobial conformity with the clinical case and also further recommendations toward the patient.

Recently in 2020, PPS on antimicrobial prescribing was also performed in Cipto Mangunkusumo Hospital.[31] Data collection from patients on antimicrobial consumption was completed in 12 days by five field enumerators. Enumerators were medical doctors or hospital staff who received one-day training in data collection guidelines.[5] As different from the previous method, PPS succeeded in gathering a larger amount of data from 244 patients who were on antimicrobial consumption. The outcomes of this PPS were characteristics of adult inpatients, antibiotic usage profile, and microbial resistance profile.

GYSSENS FLOWCHART

Criterion on the antimicrobial prescribing quality audit was developed by Kunin, et al. in 1973. This criterion was applied and performed by infectious disease specialists, and then further evolved and modified by other authors throughout time. In 1992, Gyssens flowchart was developed to assess the quality of individual antimicrobial prescriptions. The flowchart is read from top to bottom to evaluate the process outcome (**Figure 1**).[32]

Gyssens flowchart was ideally performed by experts handling authoritative criteria or comparison of agreement with local, national, or international guidelines or standards. The outcomes measurements were explained in terms: data not sufficient, not indicated, not appropriate (efficacy, toxicity, cost, broadness of spectrum), not appropriate in the duration of treatment, not appropriate in dosage (dose, dose interval, administration, and not appropriate in timing (too late/ early). To conclude this, experts evaluation was needed.[32] Moreover, Gyssens flowchart was commonly assessed retrospectively, hence missing medical record data was common.[33]

POINT PREVALENCE SURVEY (PPS)

Point prevalence survey is a cross-sectional study that identifies a number of people with

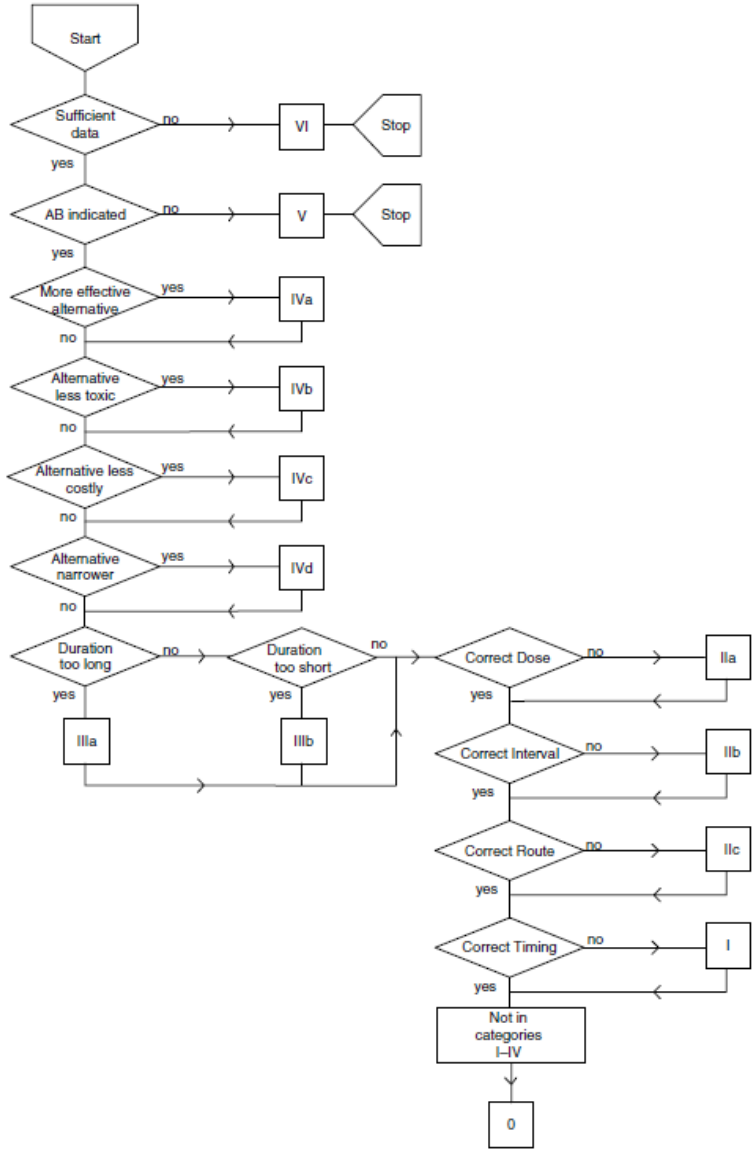

Figure 1. Gyssens flowchart.

disease or condition at one point in time.[34] One widely known protocol by Global PPS WHO performed data collection by retrieving information at ward level (as the denominator) and patient level (as the numerator) within 4 weeks. The departments involved in the survey were grouped into the medical and surgical adult department, adult intensive care units (ICUs), pediatric and neonatal department. Each ward will be alternately assessed in only one day. A multidisciplinary team will collect the data at 8 a.m. from all inpatients admitted on the ward and on the consumption of antimicrobial agents.[35]

Point prevalence survey gave snapshot real-time data on basic information from medical records and associated patient documentations. The included data were the type of ward and available beds, the number of admissions and antimicrobial consumption, patient's characteristics (age, body mass index, gender), biomarkers, culture (blood, urine, wound, sputum), antimicrobial data (include duration, start and stop date, indication, route, diagnosis, frequency, guideline compliance, review date, type of treatment), and any additional variables due to research preference. Accordingly, PPS was able to summarize quantitative and qualitative data on the prevalence of AMU, types of infection by sites and by location (community, hospital), and also quality indicators of antimicrobial, within a short duration of the study.[35,36] Figure 2 shows the concise flowchart of PPS.

Prevalence surveys on infections had been published since the 1970s in Italy and Sweden.[37,38] Hereinafter, the surveillance methods evolved into PPS on infection and related antimicrobial consumption.[39] Within a decade, national PPS had been vastly implemented in HICs.[26,40–43] Recently, PPS has been the latest trend in antimicrobial surveillance, not only because it allowed a thorough extraction of data, but also was able to generate uniform and comparable outcomes among one study to another, especially in the availability of global PPS protocol by WHO.[24,26,44]

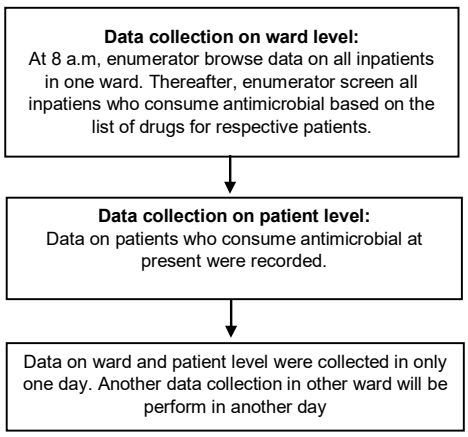

Figure 2. Flowchart of point prevalence survey (PPS) method

In years, LMICs such as Indonesia struggled with data collection and analysis on antimicrobial consumption, due to the high workload and level of resources needed for regular monitoring. PPS proposed a simpler method, therefore it could be repeatedly performed to maintain sustainability in surveillance.[26] The first PPS in Indonesia was studied by Limato, et al.[27] and was published in 2021.

POINT PREVALENCE SURVEY (PPS) VERSUS GYSSENS FLOWCHART

Based on multicenter surveys in six referral hospitals in Jakarta[27], we observed that PPS was a concise yet comprehensive method for antimicrobial surveillance in referral hospitals in Indonesia. The key of PPS method was in its study protocol which was easy and simple to be performed, even by general practitioners.[26,35] In comparison, hospital clinical rounds used Gyssens flowchart that had to be discussed among a group of multi-department experts, consequently demand bigger effort and resources.[32]

Point prevalence survey method was also capable of gathering a large database within a brief duration of the study. Surveys in two large teaching and referral hospitals in Jakarta were completed within only 12 days, respectively. In total, the duration of surveys in six referral hospitals was 40 days, conducted by 3 – 5 field enumerators, and comprised of 993 patients on antibiotics. In general, every enumerator took approximately 20-25 minutes for respective patients and was responsible for 6 – 8 patient's data every day.[27] This method of antibiotic audit resulted in faster and larger data collection compared to Gyssens flowchart implementation during clinical rounds, which was only able

Table 1. Comparison of point prevalence survey and Gyssens flowchart.

Point Prevalence Survey	Gyssens flowchart
- Concise and simple protocol study can be applied by trained general practitioners - Large data collection within a brief duration - Required time for data collection of one case/ patient was approximately 15-20 minutes - Outcomes of quantitative and qualitative data were available (included antimicrobial quality indicators) - Standardized protocols were available, therefore data on outcomes were mostly homogenous - Analysis of real-time data	- Require discussion from multi-department experts: infectious disease specialists, pharmacologists, clinical microbiologists, clinical pathologists, therapy-pharmacists, clinical pharmacists, nurses, Infection Prevention Control (IPC) members - Required time for case evaluation of one case/patient was approximately 60-120 minutes - Outcome focused on quality of antimicrobial prescribing, without data on other quality indicators - Analysis of retrospective data

to evaluate approximately 11-12 cases in 90 days. The outcome data in PPS was also comprehensive, in which it included patients' baseline characteristics, the profile of antibiotic use (prevalence, type, purpose, indication), the profile of culture and resistance, and also the presence and compliance to clinical pathway among a group of patients.[35,36] An alike data was not available from clinical rounds with Gyssens flowchart practice, albeit clinical rounds were able to analyze most complex cases compared to PPS. The outcomes of clinical rounds were also usually limited to the quality analysis of antibiotic prescribing which was specific for certain cases.[32]

Another superiority of PPS over Gyssens flowchart was its homogeneity in study outcomes. In the presence of standardized protocol by WHO[35] and Global-PPS[36], many countries all over the world performed PPS by referring to these protocols, hence the outcomes of PPS were able to be accumulated and compared from one another centers.[26] In contrast, antibiotic audit data from clinical rounds were usually fewer and heterogenous among centers, therefore outcomes collection and comparison were difficult.

In addition to that, unlike PPS which collected real-time data, an antibiotic audit by clinical round evaluated retrospective data, therefore increased concern on missing outcomes.[18,19,33,45,46] On top of that, PPS was appropriate for continuous surveillance in LMICs, including Indonesia, in consideration of its simple, repeatable, relatively low-cost practice, yet resulted in comprehensive data.[47] One study in Makassar stated that lack of manpower specialized in antimicrobial surveillance was the principal obstacle in ASP, therefore PPS supposedly ideal to overcome it.[30] **Table 1** shows differences in antimicrobial audit between PPS dan Gyssens flowchart.

CONCLUSION

Point prevalence survey was an appropriate method for antimicrobial prescribing audit and surveillance in LMIC such as Indonesia. Audit with PPS offered a concise and simple method, yet resulted in comprehensive data on quantity and quality of antimicrobial use. This method was also superior compared to the 'traditional' hospital clinical round in generating representative and homogenous outcomes that can be compared to data from other centers worldwide. Based on our analysis, we emphasize the importance of routine antimicrobial surveillance with PPS method at referral hospitals in Indonesia. The data from PPS had been proven useful for many institutions and countries, therefore it is time for Indonesia to perform adequate antimicrobial surveillance.

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