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Promoting real-world evidence use for antimicrobial stewardship in Latin America: evaluation of impact of a two-part educational webinar series

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Background: Educational programs on the use of real-world evidence (RWE) in antimicrobial stewardship (AMS) are scarce in Latin America (LATAM).

Objectives: To develop and evaluate an online educational program supporting LATAM healthcare professionals (HCP)'s ability to use and generate RWE for effective antimicrobial agent use, aligned with AMS principles.

Methods: Two 90-min webinars were developed by subject matter experts. Changes in knowledge, skills, confidence and attitudes were measured via paired PRE-and POST-intervention survey questions. Satisfaction, intent to change and remaining barriers were surveyed POST-intervention. McNemar and Wilcoxon Signed Rank statistical tests assessed differences in paired dichotomous and ordinal data, respectively. Unpaired data underwent descriptive analysis. Open-ended responses were subject to thematic content analysis (inductive reasoning approach).

Results: The analysis sample included 741 PRE-intervention survey completers (epidemiologists, infection control specialists, chemists, pharmacists, biologists, microbiologists, bacteriologists and other physicians), with 47 completing the full POST survey (33 following webinar 1, and 14 following webinar 2). A significant increase in the percent of completers who were confident of 'what constitutes RWE' was found PRE (31%) to POST (73%) intervention ($P < 0.001$). Median self-reported skill levels changed from '2-basic' to '3-intermediate' for providing examples of RWE and applying RWE in the context of AMS ($P < 0.05$). Barriers included low perceived value of RWE by administrators and limited access to appropriate data.

Conclusions: This education improved HCPs' confidence in knowing what constitutes RWE. Findings provide direction for future interventions aimed at enhancing access to and appropriate use of RWE to inform AMS in LATAM.

Introduction

Antimicrobial- resistance (AMR) is an increasing concern for health systems worldwide, and is linked to an overprescription of antimicrobial agents.[1] To mitigate this global concern, it is imperative to ensure that clinicians receive sufficient education and professional development opportunities on AMR and antimicrobial stewardship (AMS) topics, to be able to demonstrate expected clinical decision-making knowledge and skills related to the appropriate use of antimicrobial agents in the management of a wide range of infections.[2]

Real-world data (RWD) is critical to this effort and is defined as 'data relating to patient health status and/or the delivery of health care routinely collected from a variety of sources.'[3] The ability to access and analyse RWD is a prerequisite for generating real-world evidence (RWE).[4] These data are an asset to health

systems, providing localized and precise data that can facilitate timely evidence-based practices with greater efficiency than traditional trials.[3,5,6] An example of an RWD source in the context of AMS is electronic prescribing data related to antimicrobial agents.[7] From there, RWE can be generated as a synthesis of clinical experiences helping clinicians recognize patterns of risks and uses of antimicrobial treatment practices that provide essential insights into AMS effectiveness.[3]

Despite growing interest in RWE in Latin America (LATAM), awareness, accessibility, and quality of RWE remain suboptimal.[8] Limited knowledge of where to find RWD, and how to utilize it effectively impedes progress.[8] Additionally, disparities in regulatory frameworks, technological infrastructure (e.g. unlinked datasets) and engagement with the healthcare system (including medical records) further complicate the generation and use of RWE in various contexts, particularly in developing countries.[9] These barriers contribute to a persistent gap between the increasing interest in RWE and the practical ability to generate and apply it in clinical settings across LATAM for AMS.

Considering that AMS is a collective effort in the mitigation of AMR as a global public health threat,[1,10] supporting healthcare professionals (HCPs) in LATAM to utilize and generate RWE for effective antimicrobial agent use is crucial. Needs assessment-informed education that is designed to address knowledge and competency gaps of HCPs in relation to RWE use and generation is an important first step,[11] as there have been few, if any, such initiatives in the region to date. Therefore, the objectives of this study were to: (i) obtain evidence on the learning needs of HCPs in LATAM related to their knowledge, skills, confidence and attitudes with respect to their generation and application of RWE in AMS; (ii) develop a tailored educational program to address the identified learning needs; (iii) evaluate the effectiveness of the developed education in addressing the identified learning needs of HCPs in LATAM for whom the application of RWE in the context of AMS is relevant to their practice.

Methods

Ethics

The educational research study was conducted in accordance with the Declaration of Helsinki. The study protocol and related documents were reviewed by an institutional review board (*Universidad del Bosque Comité Institucional de Ética de Investigación*, study number: CIE 2023-064), and an exemption was provided on 6 June 2023, as the research was conducted in an approved educational setting, involving usual educational practices, with minimal risk. No formal informed consent was obtained from study participants, but all attendees were informed of the study's purpose, the nature and extent of their participation, and that all information collected (including their identity) would be kept strictly confidential.

Recruitment

Participants were recruited through: (i) promotional e-mails (>2000) sent to three databases of potential participants owned by the Universidad El Bosque, the *Asociación Panamericana de Infectología*, and by the education division for LATAM of bioMérieux (with no commercial purposes, built from participants' previous involvement in similar educational activities); (ii) promotional posts on collaborating organisations' social media accounts; and (iii) posters displayed at the 2023 congress of the API (September 12–15, Buenos Aires, Argentina). All promotional materials included a link to a secure website with a registration form and an invitation to complete the baseline assessment survey.

Assessment of educational needs (September—October 2023)

Potential participants were invited to complete a 10-min online survey (PRE-intervention) to assess their current knowledge, skills, confidence and attitude regarding the use of RWE in AMS. The survey was developed in line with the study objective to identify the educational needs of HCPs in LATAM. Twenty-six questions [true or false, multiple-choice and using Likert-type scales; see File S1 (available as data at *JAC-AMR* Online)] were developed collaboratively by infectious disease, clinical microbiology, and epidemiology experts (co-authors J.C.G.B., G.E., C.J.P., D.R., M.V.V.), as well as andragogy and implementation science experts (co-authors M.A., S.P., P.L.) who also ensured face validity. Questions tested knowledge (i.e. the learner demonstrates understanding of the topic) and skills (i.e. the learner can show how to apply knowledge). For each assessment of knowledge and skills, participants were asked to rate how confident they were in their responses (1-I know for sure, 2-I think I know, 3-I am unsure, 4-I don't know). This confidence-based assessment identified learners who guess versus those who demonstrate *conscious* competency. The percent of correct responses out of the 12 knowledge/skill-based questions determined each respondent's score, which was provided upon conclusion of the survey as feedback to the potential learners. A five-point Likert-type scale was used to assess participants' self-perceived skill levels (1-no skills at all; 5-expert skills), and a five-point Likert scale was used for agreement (1-strongly disagree; 5-strongly agree) in relation to their RWE knowledge, comfort and extent of RWE use (see File S1, Q15-16). Demographic information on the participants' country, profession and years of practice was collected to perform subgroup analyses of the educational needs of HCPs in LATAM. This analysis was presented at the ESCMID Global Congress in 2024.[12]

Educational program development and deployment (October 2023)

The educational program, '*Raise your evidence-based practice to the next level: Using real-world data to improve antimicrobial stewardship*', and its learning objectives, were developed by the same subject matter experts who developed and analysed the results of the baseline needs assessment to ensure alignment between the identified educational needs of learners and educational content.

Specifically, two interactive 90-min webinars in Spanish with real-time translation to Brazilian Portuguese were developed and delivered online through Zoom (Zoom Video Communications Inc). The first webinar, '*Real world data for making treatment decisions*' was facilitated by co-author D.R. on 17 October 2023. The learning objectives were to: (i) enable participants to discuss what constitutes RWE and its utility to clinical practice; and (ii) identify relevant RWD sources to inform decisions related to AMS locally and regionally. The second webinar, '*What is real world data and how to use it*' was co-facilitated by authors G.E., C.J.P., and M.V.V. on 24 October 2023. Learning objectives were to: (i) use specific sources of RWD on therapeutics and microbiology to optimize prescribing practices; (ii) identify situations in which RWE can be combined with patients' profiles to inform AMS clinical decisions; (iii) describe how evidence from RWD can be appropriately used to adjust antimicrobial treatment decisions. Webinars were recorded for those unable to join.

Online publication of enduring educational materials (November 2023—present)

Webinar recordings were made accessible online through the API's YouTube channel.[13,14] An infographic of the key takeaways from both webinars was developed (see File S2) and then later published online.

Educational outcomes evaluation (POST-intervention)

The education evaluation approach was informed by Moore, Green and Galli's framework for education planning and evaluation.[11] The framework provides a structure for the assessment of educational outcomes based on seven levels (participation, satisfaction, knowledge, competence, performance, patient health and community health). For this study, it was used to frame the survey, and design appropriate questions, measuring each relevant outcome level in line with the desired learning objectives. Assessment methods included polling questions embedded in the live webinars posed after presentation of related educational content. In addition, an immediate POST-intervention survey was used to collect repeated measures from the baseline needs assessment survey (referred to from now on as PRE- and POST-test). The POST-test was sent to webinar attendees upon completion of the second webinar.

The POST-test additionally assessed (i) satisfaction with the education via a 5-point Likert-type rating scale (1-poor; 5-outstanding); (ii) the extent to which they are likely to fulfil desired behaviours relevant to the use of RWE in the context of their AMS practice (11-point visual analogue scale: 0-not likely at all; 10-extremely likely); (iii) anticipated barriers to change (open-ended responses); and (iv) if there is a perception of bias with the educational content (yes or no with opportunity to elaborate). Complete assessment questions can be found in File S1.

Analysis

Inclusion criteria for analysis were to: (i) perceive AMS principles and the application of RWE in the context of AMS as relevant to clinical practice; and (ii) practising as a microbiologist, bacteriologist, physician, chemist, pharmacist, biologist, epidemiologist or infection control specialist. Participants were excluded if they were not one of the targeted profession groups, not in active practice, or outside of LATAM. A descriptive frequency analysis was conducted for demographics, program satisfaction, intent to adopt desired practices and perceived bias. Multiple-choice questions with correct responses were combined with their associated confidence rating. Optimal responses, demonstrating both accuracy and confidence (i.e. selecting the right answer and being confident about one's selection),[15] were recoded as a measure of success for binomial analysis. Non-parametrical PRE-POST analysis was performed on repeated measures: McNemar statistical tests were performed to assess the significance of difference in the percent of participants with measures of success PRE-to POST-intervention; Wilcoxon Signed Rank tests were performed to assess the significance of difference in the median self-reported skill levels PRE-to POST-intervention. Qualitative data from open-ended questions underwent thematic content analysis, using an inductive reasoning approach.[16] This was performed using NVivo software by a female professional researcher trained in qualitative research methods applied to andragogy and program evaluations, guided and supervised by co-author M.A. Qualitative findings were triangulated with quantitative results for completion,[17] expanding the obtained evidence regarding impact on satisfaction, knowledge and competence, and consequent changes in clinical practice through a consideration of completers' context within their setting. Data were interpreted by the same group of subject matter experts for consistency.

Results

Of the 1731 intervention registrants, 926 completed the PRE-test. From this sample, inclusion criteria for analysis had 741 target learners complete the PRE-test; 33 of whom had completed POST-test 1 (webinar-1 related questions); and 14 POST-test 2 (webinar-2 related questions). Figure 1 illustrates the flow of participation for each component of the program. The countries most represented in the three tests were Colombia and Mexico; and the most represented professions were microbiologists and bacteriologists (Table 1). There was no statistically significant difference in the percent of completers who responded correctly

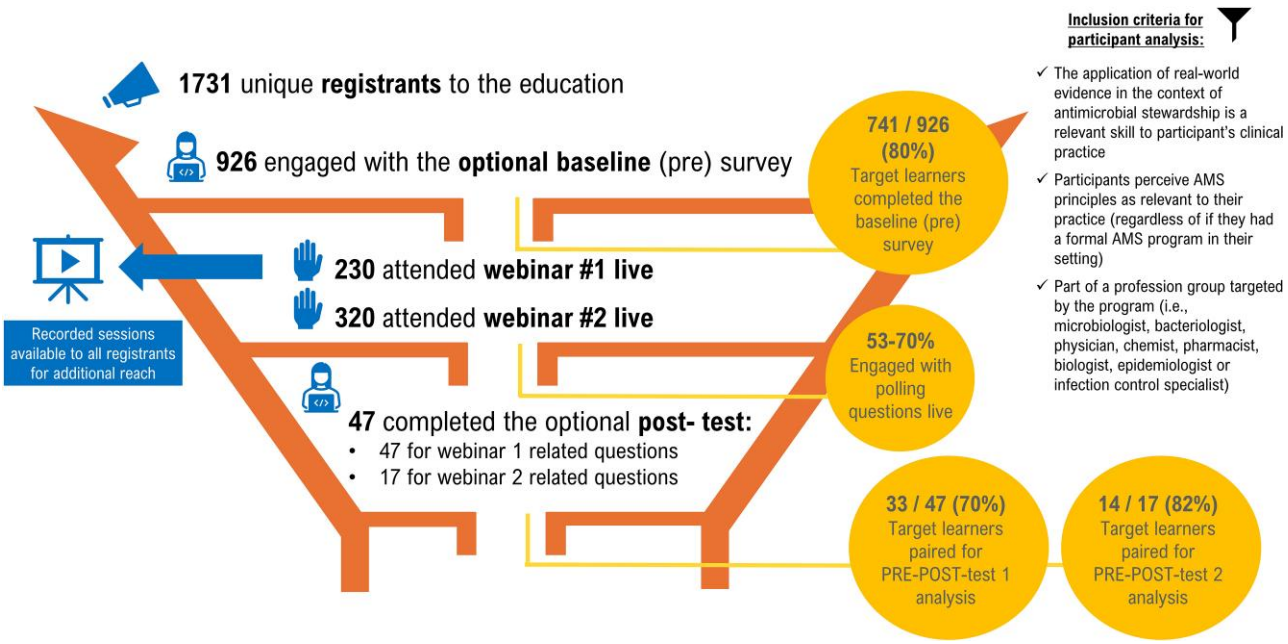

Fig. 1. Educational reach funnel of the program and its evaluation across all activity components.

Table 1. Participant demographics by completion of PRE-and POST-tests

Demographic type	Demographic sub-type	Completed PRE-test $n=741$	Completed POST-test 1[a] ($n=33$)	Completed POST-test 2[a] ($n=14$)
Country	Colombia	35% (259)	36% (12)	43% (6)
	Mexico	18% (133)	18% (6)	14% (2)
	Peru	12% (87)	0% (0)	0% (0)
	Other (<10% per country)	35% (262)	46% (15)	43% (6)
Profession	Epidemiologists/Infection control specialists	14% (101)	9% (3)	0% (0)
	Chemists/Pharmacists/Biologists	15% (113)	15% (5)	21% (3)
	Microbiologists/Bacteriologists	39% (287)	64% (21)	79% (11)
	Physicians	32% (240)	12% (4)	0% (0)
Years of practice	3–10 years	38% (283)	30% (10)	21% (3)
	11–20 years	28% (207)	33% (11)	29% (4)
	21 years or more	21% (152)	30% (10)	43% (6)
	<3 years of practice	10% (71)	3% (1)	0% (0)
	Student or resident	4% (28)	3% (1)	7% (1)
Setting	Community-based	61% (454)	64% (21)	64% (9)
	Academic Hospital/University	28% (209)	30% (10)	36% (5)
	Other	11% (78)	6% (2)	0% (0)
AMS program in place	Yes	48% (352)	49% (16)	57% (8)
	No	48% (356)	42% (14)	36% (5)
	In progress/implementation	3% (25)	9% (3)	7% (1)
	Unclear	1% (8)	0% (0)	0% (0)
Location of work setting	Urban (densely populated city)	88% (653)	94% (31)	86% (12)
	Suburban (medium density residential area, outside city centre)	10% (73)	3% (1)	7% (1)
	Rural (low density, non-urban)	2% (15)	3% (1)	7% (1)

[a]POST-test 1 refers to webinar 1-related questions, while POST-test 2 refers to questions related to webinar 2.

to knowledge- or skill-based questions PRE-to POST-intervention, regardless of their self-rated confidence level (Table 2). However, in some instances, there was a statistically significant difference in the percent of completers who were consciously competent (i.e. who responded correctly and with confidence to knowledge and skill-related questions) PRE-to POST-intervention (Table 3). This was the case for knowledge regarding 'what constitutes RWE' (PRE: 31%; POST-test 1: 73% of completers were consciously knowledgeable, $P<0.001$, $n=33$) and skills to discriminate between what constitutes RWE and what does not (PRE: 50%; POST-test 2: 64% of completers were consciously skilled, $P=0.014$, $n=14$). In addition, a statistically significant difference in the percent of completers who agreed with: 'I know at least three sources of RWE that I can use to inform my AMS practice' was found (PRE: 43%; POST-test 2: 93%, $P=0.020$, $n=14$).

A statistically significant difference in the median self-reported skill level was found amongst completers for 'identifying relevant sources of RWD', 'interpreting RWE' and 'providing examples of RWE that can help optimize microbiology diagnoses and prescriptions' (medians: PRE: 2-basic; POST-test 1: 3-intermediate, all $P<0.05$, $n=33$). Similarly, a statistically significant difference in the median reported skill level was found amongst completers for 'applying RWE in the context of AMS' (medians: PRE: 2-basic; POST-test 2: 3-intermediate, $P<0.05$, $n=14$). On average, 91% (30/33) of completers at POST reported a high likelihood (9-10/10) of adopting behaviours relevant to the use of RWE in the context of AMS in their clinical practice (Figure 2). Thematic analysis of open-ended responses indicated the following barriers to implementing clinical practice behaviours were anticipated: (i) perception that clinic or hospital administrators do not appreciate the value of adopting interventions that enable the use of RWE for AMS, (ii) a lack of access to data or training materials to implement RWE-related interventions in the context of AMS, (iii) perception of high costs and resources to implement RWE-related interventions. For example, a participant wrote in response to the anticipated barriers to the use of RWE in their routine practice:

> *I consider that one of the most important barriers will be the availability of time and access to information. I think there are people who have very fixed ideas and refuse to change their practices.*
>
> – Clinical microbiologist at community-based hospital, Mexico

Discussion

To our knowledge, this is the first continuing medical education program developed, deployed and evaluated in LATAM on the topic of RWE in the context of AMS. This topic was novel to the program participants. This may explain the placement on the lower end of the scale of median knowledge, skills and confidence

Table 2. Percentages of completers demonstrating knowledge and skills PRE-to POST-intervention

Knowledge	% knowledgeable at PRE	% knowledgeable at POST-test 1	*P*-value[a]
1. What constitutes RWE and what does not (*n* = 33)	52%	76%	0.059
2. How RWE is usually generated (*n* = 33)	64%	61%	0.763
3. The scale of data that RWE can be derived from (*n* = 33)	30%	46%	0.096
4. The external validity of RWE (*n* = 33)	39%	24%	0.197
5. The strongest study design method to obtain RWE (*n* = 33)	21%	24%	0.763
6. The appropriate use of RWE (*n* = 33)	9%	15%	0.480
7. The relevance of RWE in the context of AMS (*n* = 33)	3%	9%	0.317
Knowledge	% knowledgeable at PRE	% knowledgeable at POST-test 2	*P*-value[a]
8. Typical procedures required to generate RWE (=14)	86%	86%	1.000
Skill	% skilled at PRE	% skilled at POST-test 2	*P*-value[a]
9. Using microbiology data to inform an empirical antimicrobial treatment decision (*n* = 14)	86%	64%	0.180
10. Discriminating what constitutes RWE and what does not (*n* = 14)	79%	100%	0.083
11. Interpreting RWE in the context of AMS (*n* = 14)	29%	43%	0.317
12. Identifying relevant data sources to replicate a RWE study (*n* = 14)	64%	43%	0.317

[a]Two-sided *P* (McNemar statistical test).

Table 3. Percentages of completers demonstrating conscious competence (confident knowledge and skills) PRE-to POST-intervention

Knowledge	% knowledgeable and confident at PRE	% knowledgeable and confident at POST-test 1	*P*-value
1. What constitutes RWE and what does not (*n* = 33)	31%	73%	<0.001[a]
2. How RWE is usually generated (*n* = 33)	55%	61%	0.527
3. The scale of data that RWE can be derived from (*n* = 33)	24%	39%	0.096
4. The external validity of RWE (*n* = 33)	24%	21%	0.782
5. The strongest study design method to obtain RWE (*n* = 33)	9%	21%	0.157
6. The appropriate use of RWE (*n* = 33)	6%	15%	0.257
7. The relevance of RWE in the context of AMS (*n* = 33)	3%	9%	0.317
Knowledge	% knowledgeable at PRE	% knowledgeable at POST-test 2	*P*-value[b]
8. Typical procedures required to generate RWE (=14)	57%	86%	0.102
Skill	% skilled and confident at PRE	% skilled and confident at POST-test 2	*P*-value[b]
9. Using microbiology data to inform an empirical antimicrobial treatment decision (*n* = 14)	57%	64%	0.705
10. Discriminating what constitutes RWE and what does not (*n* = 14)	50%	93%	0.014[a]
11. Interpreting RWE in the context of AMS (*n* = 14)	29%	43%	0.317
12. Identifying relevant data sources to replicate a RWE study (*n* = 14)	29%	43%	0.480

[a]Two-sided *P*-value for McNemar statistical test is significant (<0.05).
[b]Two-sided *P* (McNemar statistical test).

ratings in relation to this specific competency area. While the program did not show significant impact on knowledge and skill acquisition alone, significant impact was observed on *conscious* competence gain for the ability to discriminate between what constitutes RWE and what does not.

The significant increase in participants' self-perceived skill level POST-intervention (from basic to intermediate levels) may also be the result of greater self-perceived *confidence*. Significant increases in self-perceived 'skill' level, which may be an interpretation of greater confidence, were noted regarding the ability to identify RWD sources, provide examples of RWE relevant to microbiology diagnoses and antimicrobial prescriptions, and interpret RWE and its application in the context of AMS. While the program may have helped learners approach using

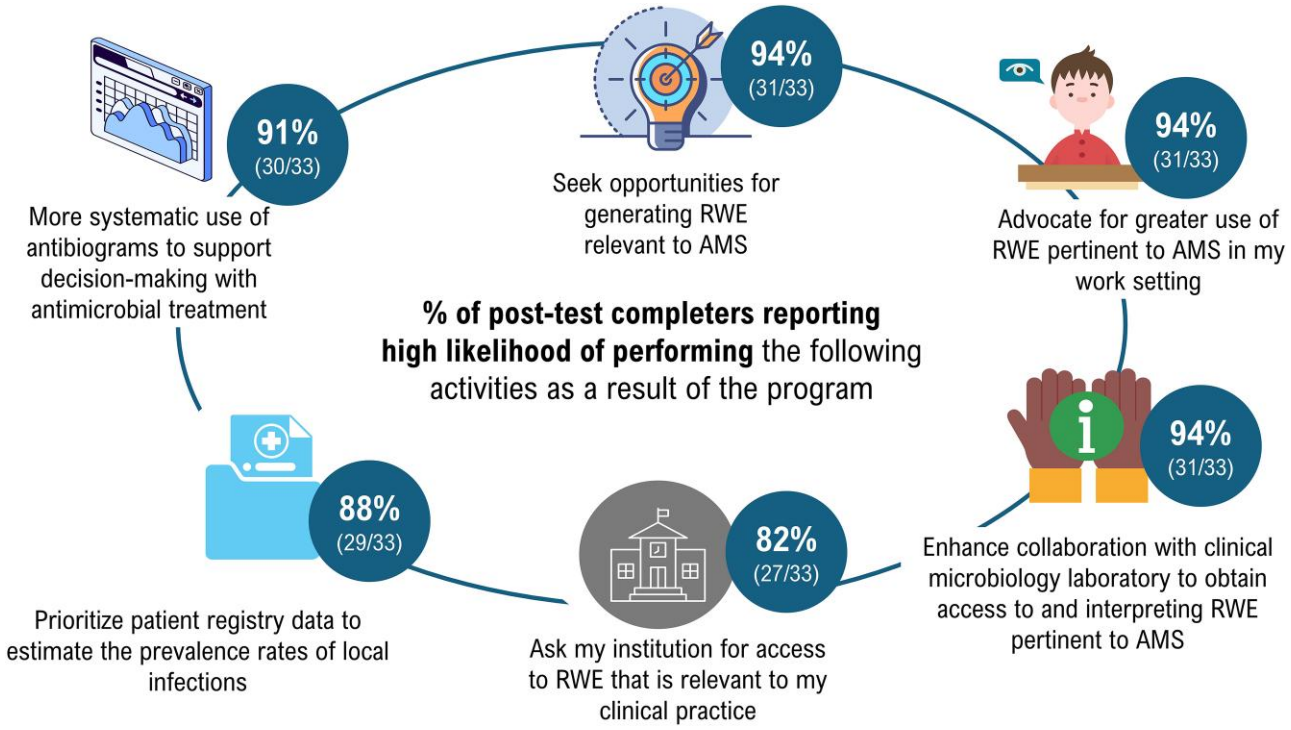

Fig. 2. Frequency of learners highly likely to perform relevant behaviours.

RWE in the context of AMS with more confidence, study findings inform us of the ongoing need to enhance learners' knowledge of the relative strengths and weaknesses of RWE, and feasible applications of RWE to inform AMS practices. Additional strategies are warranted to help learners acquire the knowledge and skills related to the intricacies of best practices used to generate RWE in the context of AMS.

The subject matter experts who designed and facilitated the content made an effort to use the live webinar polling questions to monitor the remaining educational needs of attendees and provide helpful support. Ideally, there would have been more rigorous adaptation of the educational components based on PRE-test results. However, co-authors could not predict the high level of educational gaps that were found, since no literature on the state of HCPs' knowledge in LATAM in relation to RWE applied to AMS was known to exist prior to the development of this initiative. This likely explains why the effort required to impact knowledge and skills was under-estimated at the design phase of the program. Though previously basic educational needs in relation to RWE applications in AMS were either unclear or unknown, this study succeeded in elucidating this evidence gap for subsequent investigation and program development.

The core components of the program were the educational intervention, consisting of two online webinars of 90 min each, and the associated outcome assessments (PRE-POST-tests). The educational webinars dived rapidly into complex applications of RWE in various research contexts, including AMS (which was the focus of the second webinar). Adaptations to the core components of the program may involve first an introductory webinar that outlines the basic concepts, terminology, and methods pertinent to the topic, since this study indicates greater gaps in knowledge on the topic than expected. A priori familiarity would facilitate communication and contextualisation of the existing webinar content. From this starting point, participants might be directed along a learning pathway that includes, when needed, additional content that is suitable to their existing knowledge level.

The second recommended adaptation would be to prioritize self-paced learning formats, as opposed to live formats. Self-paced learning formats could support better personalisation of the learning experience, allowing learners to revisit elements of the content at will to ensure optimal understanding and be more adapted to the busy schedule of clinicians and professionals working in a laboratory or in hospital settings.[18,19] Barriers to attendance were minimized by offering the enduring online webinar recordings and the infographic; however, more could be done to encourage engagement. Novel educational formats informed by the context, needs, and goals of learners in collaboration with stakeholders are associated with successful outcomes.[20] Therefore, offering multiple smaller online modules with immediate testing may make the educational process more enjoyable and feasible to the learners. In the same sense, rewarding PRE- and POST-test participants with a certificate of completion could further incentivize targeted learners to fully engage with the program.

An encouraging majority of participants (91% average, $n = 33$) reported a high likelihood of performing behaviours relevant to the use and generation of RWE in the context of AMS in their clinical practice. Despite this, strong barriers to implementation indicated an opportunity for additional learning programs to overcome that which complicates the use of RWE in practice.

In open-ended responses, participants reported a perception that clinic or hospital administrators undervalue the need to

adopt programs enabling the use of RWE for AMS. In addition to recommending a preliminary educational session, we reiterate the need for localized, contextual adaptations to educational interventions. Many studies have been published demonstrating the effectiveness and relevance of such interventions on interprofessional communication and collaboration, standardized operating procedures and workflow.[21,22] This type of intervention may be relevant to physicians who aim to improve communication and collaboration with clinical microbiologists to obtain access to antibiograms.

Finally, future initiatives may include deploying and evaluating performance improvement and quality improvement interventions within the hospital setting that include an initial environmental scan of attitudes and openness to integrating RWD into practice, from administration to the clinical level. Importantly, recognising the variation in individual countries, provinces/states within countries, and even sites in LATAM would be especially relevant, considering the diversity of health systems present within this region of the world.

Limitations

An important challenge to this study was the absence of existing data on the core knowledge levels of targeted professionals related to RWE and AMS programs, which limited comprehensive guidance on specific learning objectives and educational outcomes that ought to be impacted prior to project onset. Though this study has helped provide evidence on this subject, calibrating the study tools and education further to individuals' learning needs may have resulted in survey items and content of greater impact. Further, while the study tools were reviewed and face validated by subject matter experts specialized in professional fields targeted by the study, the tools were not pilot tested by a wider pool of targeted learners for increased validity assurance. In terms of participation outcomes, while the obtained sample size for the PRE-test alone was close to the expected number ($n=1050$), attrition in webinar engagement and subsequent participation in the POST-tests substantially reduced the final sample size and resulting power for the evaluation of significant changes in the educational outcomes achieved by the program, let alone across distinct subgroups of completers. According to sample size calculations, the final sample for POST-test 1 ($n=33$) could detect significance in impact by McNemar statistical test for a minimum of 33% completers shifting from an unsuccessful (0) to a successful (1) measure, if a maximum of 5% completers also shifted from a successful (1) to an unsuccessful (0) measure. For POST-test 2 (n-14), even larger impacts should be achieved to assess significance. Arguably, the low sample and power achieved most likely under-estimated the educational outcomes resulting from the developed intervention. Nevertheless, we hope that the provision of this study with its tools and results can help guide future initiatives with even more significance to the community. Additional validation of tools may be warranted to ensure ongoing relevance and applicability.

Conclusion

In conclusion, this project contributed to reducing the current paucity of educational programs available in LATAM to help HCPs acquire knowledge and skills in using RWD and RWE to optimize the diagnosis and treatment of infectious diseases. The evaluation of the educational program demonstrated a high need for education in LATAM, where the majority of HCPs for whom AMS was reported as relevant in their clinical practice demonstrated a sub-optimal level of knowledge and skills to use RWE in their clinical context. The educational topic was novel to the learners, which indicated an important starting point for RWE generation and use in microbiology, diagnoses, and antimicrobial prescriptions in LATAM. The remaining gaps and barriers identified as part of this study are crucial elements to inform and improve future interventions in this space with aligned strategic goals.

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Transparency declarations

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Author contributions

M. A. supervised the implementation of the study design, the investigation process, formal analysis and interpretation of findings, and led the development of the manuscript original draft, as well as review and editing process of manuscript. J. C. G.-B. took part in the conceptualisation of study goals, coordinated the educational content with the steering committee, reviewed and edited research design and tools, and actively took part in the multidisciplinary interpretation. M. V. V. acted as the chair of a steering committee of clinical experts that also included G. E., C. J. P. and D. R. That steering committee designed and facilitated the education activities, and also reviewed and edited research design (including data collection tools), and actively took part in the multidisciplinary interpretation. D. D. L. supported development and distribution of the

education activities. S. P. led the conceptualisation of study goals, was involved in the research design, provided supervision and oversight of the research process. P. L. supervised the study design, investigation process, analysis and interpretation. All authors critically reviewed the manuscript and approved of the final version to be submitted.

Data availability

The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Supplementary data

Files S1 and S2 are available as Supplementary data at *JAC-AMR* Online.

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