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Development and assessment of an online communication skills course to optimise antibiotic prescribing for children in primary care

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Abstract

Background Antibiotic overprescription is a complex global problem that contributes to antibacterial resistance. Enhancing professionals' communication skills is one of the most promising interventions for optimising antibiotic prescription in respiratory tract infections in children.

Methods We developed a communication skills course for primary care paediatricians, paediatric nurses and community pharmacists. We conducted: 1) A scoping review, 2) brainstorming and selection of themes, 3) design of content, 4) user testing, through a survey and semi-structured interviews. A multidisciplinary advisory group gave feedback throughout the design and development process. We conducted a descriptive analysis of the survey results, and we used a predefined analytical framework for qualitative content.

Results The course comprised four modules with nineteen themes, which included communication theoretical content, clinical cases, complementary reading, videos, and a glossary. It also included a forum and webinars, after each module. Sixteen users completed several themes and a survey, and eight were interviewed. They rated a mean of 4 or higher (5-point scale), across most of the domains evaluated. The videos received the highest rating (4.81; SD = 0.39). Suggestions for improvement included incorporating a workshop, and featuring more representation of other professionals. The majority of professionals (93%) expressed interest in completing the course.

Conclusion We developed a comprehensive, evidence-based online communication skills training course to optimise antibiotic prescribing in paediatric primary care. Integrating key communication strategies and insights from a scoping review, the course equips healthcare professionals with practical tools to enhance shared decision-making and antimicrobial stewardship.

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Trial registration Not applicable.

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Background

One of the greatest public health challenges today is the fight against antibiotic resistance, which requires an effective One Health approach to avoid millions of deaths worldwide [1]. Antibiotics are overprescribed in all settings [2]. 30% of ambulatory oral antibiotic prescriptions across all conditions may be inappropriate [3] and broad-spectrum agents may be prescribed at 61% of visits [4]. In paediatric outpatient care, antimicrobials are prescribed almost twice as often as expected for acute respiratory tract infections (ARTIs) [5]. Antibiotic prescription for most non-complicated ARTIs is associated with no or few benefits and an increased risk of secondary effects [6].

Antibiotic prescribing is a complex process influenced by factors affecting healthcare providers, patients, the public and the healthcare system [7]. Physicians are aware that antibiotics are of limited benefit in some conditions, but recognise the influence of patients' requests and expectations, uncertainty, complacency, fear or time pressure [8–11]. Doctors in training are also influenced by fear of criticism within hierarchical medical relationships [12, 13] and nurse prescribers by diagnostic uncertainty, families' pressure and their own training and experience [14]. Patients, families and the public often have incomplete understanding and misperceptions about antibiotic resistance [15, 16].

ARTIs represent a natural target for antimicrobial stewardship (AMS) interventions. These interventions require coordination across different professional categories. For example, while community pharmacists have a positive perception of AMS, they require enhanced AMS training, a clear understanding of local prescription guidelines, and a well-defined role to effectively collaborate with physicians [17]. Systematic reviews have identified the most successful interventions for AMS: audit, feed-back, education (communication skills and shared decision-making), clinical decision support systems, point of care testing, less pressurized consultations and delayed prescribing [8, 11, 18–21]. Combined interventions have shown to be more effective [21, 22].

Several systematic reviews have identified the most effective strategies for reducing inappropriate antibiotic prescribing in children with ARTIs. Multifaceted and computer-based interventions help translate evidence into practice [23, 24]. Key findings highlight that successful approaches actively engage children, provide clear symptom guidance, and incorporate delayed prescribing strategies [25]. The most effective interventions use automatic prompts, emphasize clinician leadership in their design [26], and target both parents and healthcare providers [26, 27]. Notably, interventions that enhance communication between patients and clinicians have the greatest impact [26, 27]. Effective communication skills play a crucial role in understanding and addressing families' concerns, helping doctors feel less pressured to prescribe unnecessary treatments [28]. Parents often seek reassurance and guidance about their children's illnesses and value accessible educational materials [29]. Providing written information can also contribute to reducing antibiotic prescriptions for ARTIs [30].

Communication skills training teaches healthcare professionals to communicate effectively with patients and families, understand their concerns and expectations, provide information on expected disease course, recommend treatment options and give a contingency plan if symptoms do not improve [31]. Clinical communication is nowadays one of the core competencies for healthcare professionals [32]. Professionals who train their communication skills are more likely trusted by patients, especially assertive clinicians [33]. In the context of paediatric care, a strong relationship with families is particularly important [34, 35]. This requires close collaboration between paediatricians and nurses [35]. A recent study in the USA [36] showed the effectiveness of a distance learning program to reduce outpatient antibiotic prescribing for ARTIs in paediatric care.

There are no studies in Southern Europe about the effectiveness of communication skills training for reducing antibiotic prescriptions in ARTIs in paediatric primary care. More studies are needed.

The OptimAP project *('Optim' from optimise and 'AP' from primary care, in Spanish)* aims to evaluate the impact of a communication skills training program for healthcare professionals and an educational app for parents on antibiotic prescribing for ARTIs. It includes the development of these interventions and a randomized, multicenter, factorial clinical trial conducted in four regions of Spain to assess their effectiveness [37].

Methods

We developed a communication skills training program for healthcare professionals as one of the two interventions of OptimAP.

Development of the course

It was designed and developed by a multidisciplinary team including a core group (investigators and clinical experts on communication skills), and an advisory group (paediatricians, nurses, pharmacists, epidemiologists and patient representatives). The course was aimed at paediatricians, paediatric nurses and community pharmacists.

The course development followed a rigorous process comprising several phases (Fig. 1): a) a scoping review, b) brainstorming, theme selection, and teaching content design, and c) user testing.

Scoping review

It was conducted as a review of reviews to identify the most effective components of previous interventions aimed at reducing the prescription of antibiotics in acute respiratory infections in the paediatric population in primary care. Other objectives were to determine the facilitators, barriers, and implementation considerations related to the assessed interventions, and to map contextual factors that influence antibiotic prescription in acute, uncomplicated respiratory tract infections in primary care [38, 39].

Design of the content

The core group developed the content and the advisory group gave feedback and suggested changes in an iterative process until the result was optimal. The content was settled in a Moodle platform [40]. A logo was designed, representing communication skills and parents empowerment (Appendix A).

User-testing

We developed a survey based on the User Experience Honeycomb model [41], including 19 items that were answered either using a 1 to 5 Likert scale or through open-ended questions. On the Likert scale, a score of 1 represents the lowest rating, and a score of 5 represents the highest. Each question assesses a specific aspect (Appendix B). The Honeycomb model has seven categories: accessibility, credibility, desirability, findability, usability, usefulness and value (Table 1). We included further questions, such as the interest in additional reading and in continuing the course.

Once developed the first part of the communication skills training, we selected a convenience sample of paediatricians, paediatric nurses and community pharmacists of different gender, ages and from both rural and urban areas. We asked them to test a part of the communication skills online program and fill the survey. Participants received a user guide (Appendix C) with a username and password.

Survey participants were invited to participate in semi-structured interviews aimed at gaining a deeper insight into their opinions. A script tailored for this study was devised, drawing upon the Honeycomb categories (Appendix D). These interviews were conducted by a member of the research team. Data collection consisted of audio recordings of the interviews, which were transcribed verbatim.

Ethics

The OptimAP project was approved by the ethics committee (IDIAP Jordi Gol: 19/019-P). Written and verbal informed consent was obtained for the interviews, in accordance with the Declaration of Helsinki.

Data analysis

We conducted a descriptive analysis of the survey questions and calculated the mean score and standard deviation of the responses to the Likert-scale questions for each thematic area. For the analysis of quotes from the open-ended questions of the survey and the semi-structured interviews, we applied a framework analysis [42]. The categories of the Honeycomb model, and new generated categories were used to classify findings. Users feedback was classified as positive, negative or specific proposal. Negative input was classified into three categories:

- Stopper (high degree of uncertainty, dissatisfaction or impossibility of progression).

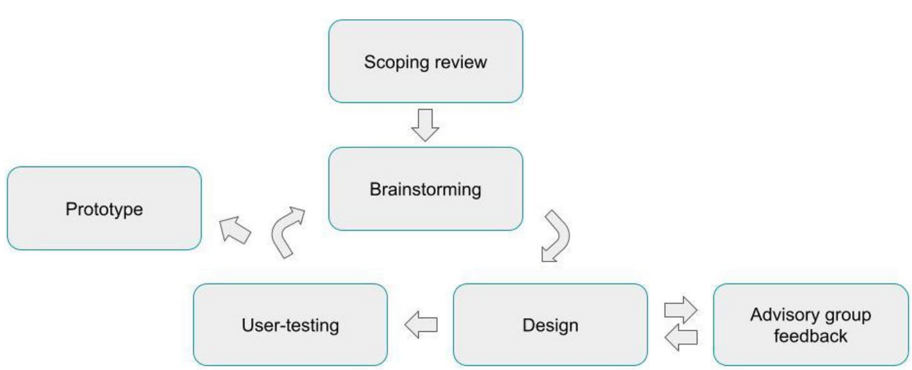
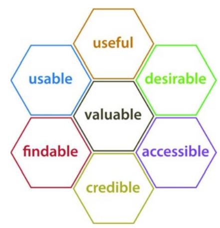


Fig. 1 Phases of the development of the communication skills course

Table 1 Peter Morville's "User-experience" theoretical framework[1], and their definition in the context of the communication skills training program

Accessible	Was it easy to access the training program content?
Credible	Can this course help for the purpose for which it is designed?
Desirable	Does this course respond to a real professional need?
Findable	Was it easy to find the different parts of the training program content?
Usable	Was it easy to use the Moodle Platform?
Useful	Is this course useful and applicable to your daily practice?
Valuable	Is the content of this course valuable?



[1]developed by Peter Morville and adapted by Rosenbaum

– Major problem (solvable problems).
– Minor problem (format or aesthetic issues).

We charted findings to facilitate analysis. The analysis was cross-checked by a second researcher for accuracy. Disagreements were solved by discussion. The analysis process was then supervised independently by an external collaborator and a senior researcher.

Results

Scoping review

We identified 33 reviews, 11 effectiveness' reviews of educational interventions and 22 contextual factors' reviews. Based on the findings we implemented several features in the online training including: written material and infographics to use during the consultation, and content about shared decision-making, delayed antibiotic prescribing, and appropriate language when informing families (Appendix E). The results of our scoping review were published elsewhere [39].

Educational program

The educational program (Appendix F) was structured in four modules comprising 19 themes ('capsules'), with communication theoretical content, clinical cases, complementary reading (Appendix G), 28 videos (Appendix H) and a glossary of communication terms (Appendix I).

The four modules were:

1) Warming up: introduction to the world of communication.
2) Sailing together: collaborative practice and community approach.
3) Navigation chart: key aspects of the exploratory phase.
4) Coming through safely: managing the resolutive phase.

The program was accredited with 25 h of online training and 3.7 credits by the Catalan Council for Continuing Education for Health Professions. To obtain accreditation, participants must complete all four modules with at least 70% of their contents and a module test score of at least 70%.

Theoretical content

The theoretical content was based on communication skills for the clinical interview [33, 43] and the biopsychosocial model, which approaches health and illness as the result of the interaction between physiological, psychological, and sociocultural factors [44]. The course content included practical examples of daily consultations, with dialogues between professionals, families and patients.

Video production

The different phases were:

– Development of teaching content (definition of objectives, script writing),
– Selection of real professionals and families,
– Rehearsal,
– Script adaptations.

The project needed the collaboration of a graphic designer, a cameraman, a sound specialist, and a video editor. The videos were edited and then reviewed by the communication skills experts, and included teaching subtitles that highlighted parts of the script or indicated the shown communication skills relevant in the training program.

Table 2 User-testing participants' characteristics

	n	Percentage
Profession		
Paediatrician	9	56.25%
Nurse	3	18.75%
Pharmacist	2	12.50%
GP	2	12.50%
Gender		
Woman	12	75.00%
Man	4	25.00%
Years of exercise		
< 10 years	5	31.25%
10–20 years	5	31.25%
> 20 years	6	37.50%
Area		
Urban	9	56.25%
Rural	7	43.75%
Previous formation		
None	4	25.00%
Self-learning	5	31.25%
Lectures	3	18.75%
Workshops	4	25.00%

As an example, we present one of the videos (Video 1), in which the nurse negotiates a demand for antibiotics.

User-testing

Once the first module was developed, we contacted 24 professionals and invited them to participate by reviewing a section of the module and sharing their feedback. 16 professionals (66.7%) agreed to participate and sent us the completed survey. The data about participants of the user-testing is described in Table 2.

Quantitative data

The survey data indicated that the highest-rated domains by professionals who participated in the user testing were: the usefulness of the videos ($M = 4.81$, $SD = 0.39$), the clarity of content delivery ($M = 4.81$, $SD = 0.39$), and the overall usefulness of the course ($M = 4.75$, $SD = 0.43$). Additionally, other highly rated domains included the course's credibility for learning communication skills, the usefulness of theoretical content, the effectiveness of instructional subtitles, and the course structure (all with $M = 4.69$, $SD = 0.46$). When asked, 93% of the participants stated that they would be interested in completing the course. The complete quantitative analysis of the survey is presented in Table 3.

Qualitative data

Eight professionals accepted a semi-structured interview (50% of the participants). Six were video calls and two were face-to-face, with a duration of approximately twenty minutes. Below we summarize the opinions of the interviewees, classified according to the predefined categories, and the answers to the open-ended questions (see Table 4 for representative quotes):

Table 3 Rating results of the evaluated domains

Honeycomb domains	Mean	Standard deviation
Credibility (antibiotic prescription)	4	0.79
Credibility (communication skills)	4.69	0.46
Desirability of the platform	4.31	0.77
Desirability of the course	4.50	0.50
Usability	4.44	0.61
Usefulness of the course	4.75	0.43
Usefulness of the theoretical content	4.69	0.46
Usefulness of the videos	4.81	0.39
Usefulness of the audio tracks	3.88	01.05
Usefulness of the teaching subtitles	4.69	0.46
Other domains		
Clarity of content exposure	4.81	0.39
Extension of the course	4.31	0.46
Structure of the course	4.69	0.46
Technical quality of videos	4.50	0.61
Technical quality of audio tracks	4.50	0.50
Interest in continuing the training	4.47	0.50

Credibility

Most professionals thought that the course served the purpose for which it was designed, since it provided tools to improve their communication skills. For those who had previous training in communication skills, the course helped refresh their knowledge. Motivation was mentioned as necessary for learning communication skills. Some doubts were expressed about the course's credibility for reducing antibiotic prescribing.

Desirability

Most professionals regarded the course as desirable, as it addressed their needs and they deemed it important to acquire or enhance their communication skills. Learning to better face different kinds of situations with the families in consultation or the pharmacy and managing uncertainty or the antibiotic demand were the most mentioned motivations. The desirability of the Moodle platform aroused different opinions: some professionals found it fine and others considered it not very aesthetic.

Usability

Interviewees found that the Moodle platform was simple, intuitive, and especially well organized. Veteran professionals were less familiar with digital technologies and found issues in access and navigation, although they were easily solved. Some interviewees mentioned that access from the mobile phone or their work computer was not possible.

Table 4 "User-experience" domains and representative quotes

Domain	Representative quotes
Credibility	*"But I believe that yes, it has tools to improve, to help to improve, yes… But the thing is that you have to overcome the laziness to start doing it" (Woman, 64 years old, paediatrician).* *"…I see it more aimed at learning communication skills to be assertive with any treatment, not only for the prescription of antibiotics…. So, I see it as more useful for everything, not only for antibiotics…" (Woman, 51 years old, nurse)*
Desirability	*"Theory is fine, but you have to be able to apply it in your daily work or personal life, and it is true that the videos show realities that you encounter every week in the practice… you see yourself mirrored in "well, look now, I do this OK" or "I did this badly, I usually do this badly, and if you actually see it, it is much more useful, I think" (Woman, 47 years old, nurse)* *"In reality that's why I want to do the course, to make some changes, even if they are small, that will help me with parents." (Woman, 41 years old, paediatrician)* *"I find the digital platform, in general, very easy to use, with a very pleasant design." (Woman, 27 years old, pharmacist)* *"…with respect to the course itself, I think it's fine, I wouldn't change much, maybe the appearance, to make the screen more visual.. it's monotonous, it's not very visual…" (Woman, 38 years old, paediatrician)*
Usability	*"It's easy and intuitive." (Woman, 48 years old, paediatrician)* *"…I think the biggest problem with this, is my age and my technological difficulties, you know, because I think I take detours to get to each place…" (Woman, 64 years old, paediatrician)*
Usefulness	*"You have summarised the texts that appear in the bibliography very well, and you have taken what is most practical, concrete and useful for us… The truth is that I found it very useful and applicable to any paediatrician/family encounter". (Man, 52 years old, paediatrician)* *"I thought it was very cool because I could see reflected in the videos what was explained in the theory, and I think these are things that happen to me every day…I worked in urgent care, and many of the scenes in the videos came to me". (Man, 33 years old, paediatrician)*
Value	*"The videos and the subtitles of the videos, commented, have been great, that's the best…, that's super cool, huh?…. those two versions of what happens or how they respond if you are very authoritarian or if you show that you want to understand them" (Woman, 41 years old, paediatrician)* *"In my case, I love communication and I had a great time… it's fantastic because it goes over the whole interview, it teaches you how to negotiate…(…) I congratulate you, because it has been a very good and very necessary outline of communication (…)" (Woman, 64 years old, paediatrician)* *"I loved the videos because, of course, in a very short time you see what we normally do, if we do it well, if we don't do it well, the consequences it has, and then you have another video that shows you how we could do it, so it's very good". (Woman, 47 years old, nurse)*

Usefulness

When taking a course, professionals usually look for new knowledge applicable for their practice. Participants found the course reflected their daily job and gave them tools to handle typical situations. After the course, they were able to apply some of the learnt skills in consultation and to identify better when they did not communicate well. Videos were considered the best part of the course; the theoretical content was well valued, and considered concise and complete. There were diverse opinions about audio files and complementary readings.

Value

The course was considered valuable. Professionals appreciated the videos, especially those that had two versions of the same situation, and also the subtitles showing the specific communication skills they were learning. Some veteran paediatricians thought this course was so valuable that it could be used for other prevalent health problems and not only for the optimisation of antibiotic prescription.

The categories findability and accessibility were finally not included, as the investigators found that they did not contribute to a better understanding of the opinion of the professionals, and could be considered included in the usability category. We identified several new domains listed below generated during the qualitative analysis (see Table 5 for representative quotes):

Communication skills

Several professionals pointed out the importance of learning or improving communication skills in healthcare professions, while previous interest in the subject varied from one professional to another. One paediatrician expressed that he found the topic so important that this kind of course might be mandatory for clinical doctors.

Identification

Professionals considered that the course represented their daily work and the problems they usually face in the relationship with families. They considered that it was designed for their professional category, but a nurse mentioned that she would appreciate more representation of the nurses in the videos.

Understandability

The theoretical content of the capsules was clear, concise and understandable. The structure of the course was well valued and helped for the understanding. Some specific proposals were made such as shortening the content, adding communication exercises or a forum for the students.

Table 5 New domains and representative quotes

New domains	Representative quotes
Communications Skills	*"There are a series of courses in medicine that should be mandatory, and should even be taken every year or every two years. Maybe because of the topic of the course some people might not be very interested, but I think it's basic, because expression, our way of communicating, in the end, is almost more important than the knowledge we have". (Man, 33 years old, paediatrician)* *"New or newly arrived paediatricians or paediatricians with little experience may not be as aware of these types of issues. I think the course is good." (Man, 58 years old, paediatrician)* *"The healthcare professional, from my experience, receives little or no training in communication and, paradoxically, must communicate with their patients every day. Training in patient communication is very useful". (Woman, 27 years old, pharmacist)*
Identification	*"I think so, in the course, there are many situations that are explained, they are situations that we experience every day… we are tired… we tend to solve them in ways that are not optimal, so remembering these techniques comes in handy". (Woman, 38 years old, paediatrician)* *"It is true that the videos teach us realities that we find every week, in our practice, because every week someone comes to you with a similar situation…, so if you watch it many times, you see yourself reflected in"well, look, I do this well"or"look, I did this horribly", I usually do this badly, and if you see it, it is much more useful, I think". (Woman, 47 years old, nurse)*
Understandability	*"Here, with the capsules, with the initial introduction that you do, then you read the article and some others, and you summarised it very well… the introduction of each capsule and the videos seemed to me to be very appropriate; you read it, you understood it, and it was very useful." (Man, 52 years old, paediatrician)* *"What you have written, I think is very easy and quick to read, not at all tiresome, it's well done, in my opinion… No, I think it's in good shape, the videos are very good, for me the videos are almost the best part, the text is very good because it's short and very entertaining, the articles are not too cumbersome, and the audio files have been particularly useful for me… the most tedious thing, was the article on empathy because it was very dense". (Man, 58 years old, paediatrician)* *"Very succinct but without losing content. I liked it". (Woman, 59 years old, nurse)*
Online teaching programs	*"Well, you know, to me, I think online courses are an advantage, and the pandemic has brought them to us, and I think we need to take advantage of this, I think it's something we need to learn". (Man, 52 years old, paediatrician)* *"Practising would be best, but, since it's going to be online, the videos are very cool." (Woman, 41 years old, paediatrician)* *"It lacks a little bit of practice too, you know? Perhaps, it could be concluded with a workshop (…), with a practical workshop". (Woman, 64 years old, paediatrician)*
Problematic around antibiotic demand	*"Yes, yes, of course, if you spend the time needed, and explain families why the antibiotic yes, the antibiotic no, and you give them a complete overview and argue, obviously, it is clear that yes, because they are explaining to you why". (Woman, 51 years old, nurse)* *"It's very difficult with the pressure of "oh my dear child, he feels very bad, he's been like this for four days", and you are more or less or almost 100% sure that it is a viral illness that may need to be looked at again, and be reassessed… they make you doubt about yourself,… "oh my, what if this gets worse because I decided not to prescribe an antibiotic?" (Man, 33 years olds, paediatrician)* *"In this case, the prescription of antibiotics, I no longer have such a problem with, because I think that the new generations are not so demanding with respect to antibiotics". (Man, 58 years old, paediatrician)*

Online teaching programs

The online format had good acceptance across professionals of different fields and ages, as professionals are nowadays familiar with online courses. While some professionals proposed including a practical part in the course such as a tutorial or workshop, others considered that the videos were a good substitute for practice.

Problematic around antibiotic demand

Some professionals pointed out that the demand for antibiotics was a frequent situation in their clinical practice and explained they had problems baring parents' pressures and uncertainty, although clinical experience and having a previous relationship with the families helped to avoid conflicts. Being well-trained in infectious diseases and explaining with arguments was considered very important to manage these situations. Senior professionals expressed that the demand for antibiotics was a bigger problem years ago than now, because parents now understand better that viral infections don't need antibiotics.

The most significant changes we made to the course after analysing the user testing results were: adding webinars at the end of each module, as well as a forum, and creating shorter training capsules. Additionally, we prioritised videos over audio content and included more videos featuring nurses, pharmacists, and diverse families. We also incorporated specific training on managing ARTIs based on participant feedback. Tables 6 and 7 present the problems and suggestions reported by users, along with representative quotes, and the specific actions taken to enhance the course based on the user testing.

Discussion

Discussion

Main findings

We developed a communication skills course, with rigorous methods, focused on antibiotic prescription in children, and targeting relevant stakeholders, which was well received by professionals, specifically for its usefulness, credibility and desirability.

We focused the training on daily consultation and pharmacy, with the aim of helping professionals to face common situations where the demand of antibiotics is present. Furthermore, we aligned the content with the phases of the standard semi-structured clinical interview (exploratory and resolution phases). The importance

Table 6 Problems, representative quotes, and changes applied

Problems and severity	Representative quotes	Changes applied
Excessive duration of the course Major problem	*"At the beginning it seemed a lot to me, I thought: "Oh my god, there are so many modules and so many capsules in each module", (…) if you find a lot of subsections you might think that it will be very long and take a big effort, but it's not the case… (Woman, 41 years old, paediatrician)* *"I didn't think I would have to put in so many hours…. It took me quite some time, yes… Not everybody has that much patience… Maybe a little long for the goal that you want to achieve, which is already a big accomplishment for paediatricians, not to prescribe so many antibiotics". (Woman, 64 years old, paediatrician)* *"I found the article on empathy the most cumbersome because it was really dense…. (…) it is 8 pages long and with small print". (Man, 58 years old, paediatrician)*	We made the capsules of the following modules shorter Complementary reading was included in most of the capsules as additional teaching material (not mandatory for completing the training) We included videos with music and some with touches of humour to make learning easier
The audio files were not as good as the videos Major problem	*"You could hear them fine. Maybe less than the videos, because image and sound give much more information, the video, well, but I wouldn't shorten it either, because it's… Maybe I liked them less… The audio files, well, I thought to myself that maybe you were already tired of making so many videos…" (Woman, 64 years old, paediatrician)* *"I wouldn't include audio files…. Video content is much more useful, to be honest, and, besides, video is much more authentic, audio seems more artificial, like more theatrical." (Woman, 47 years old, nurse)* *"The audio files didn't appeal to me, with what you wrote and the video, I think it was enough". (Man, 58 years old, paediatrician)*	We didn't include audios in the following modules
The Moodle platform was not very aesthetic Minor problem	*"About the course itself I think it's fine, I wouldn't change much, maybe the appearance, to make it more visual" (Woman, 38 years old, paediatrician)* *"not very visual, little visual separation of the sections… it's monotonous, not very visual…" (Woman, 38 years old, paediatrician)* *"I feel like I've already seen it, I've seen it, as if I had really seen it before". (Woman, 47 years old, nurse)*	We changed the colour of the platform to a softer blue
Nurses are not represented enough in videos Major problem	*"The videos and audios seem to be intended only for paediatricians, since none of the videos and audios that I have viewed include a nurse's practice". (Woman, 47 years old, nurse)*	We included more videos with situations involving paediatric nurses and pharmacists
Problems in the access or use of the Moodle platform. Minor problem	*"It is always difficult for me…. I am not the most expert and skilled person in getting into all these virtual platforms, and so on, because whenever I do a course I have these same difficulties…* *At the beginning I realised that I didn't know why I had to go to the right… (…)* *Afterwards, once I saw how it worked, I realised that it was really very easy, that the problem was mine…" (Woman, 51 years old, nurse)* *"At first I had problems since there was no audio in the computer at work, and it didn't allow me to download the images. Then, at home, I was able to work comfortably and move around the platform". (Woman, 59 years old, nurse)*	We gave the professionals an email for direct contact with a member of the team, if they experienced problems in the access or navigation
Some videos didn't seem very realistic. Minor problem	*"The video seems unrealistic to me but it serves as a teaching aid…" (Woman, 62 years old, paediatrician)* *"In the videos I liked the role of the families more, I mean, I found the role of the grandmother, the father, the girls, more real than the doctor, the doctor's role was less natural, and on the oher hand, the families were more bold, yes. (...) I found the grandmother's position more authentic... Perhaps the medical professional is a bit strained, she was too kind/empathetic/assertive..." (Man, 52 years old, paediatrician)*	We made appointments with families and professionals, before the recording, to do a rehearsal with experts in communication skills. We made changes to the script after the suggestions of the participants or the cameraman to make it more realistic

Table 7 Specific suggestions, representative quotes, and changes applied

Specific suggestions	Representative quotes	Changes applied
Include a summary of the most important communication skills	*"I would find it useful… to make a video of your summary in audio file, of the most important points or of the ones you don't want us to miss in the readings… or of the most important techniques or of the most important concepts…" (Woman, 41 years old, paediatrician)*	In each webinar, we shared a powerpoint summarising the most important communication skills of each module
Include a workshop, a tutorial or another practical training	*"I don't know if it would be possible to do individual tutoring, but that's impossible, or maybe in groups…. You might be embarrassed or you find it difficult and say:"How awkward!"But it is really the only way in which…, that is, first, you see what it's about, what you have to do or…, you see it, and then you have to practice it, because if you don't, it's just another thing you know and you don't apply". (Woman, 41 years old, paediatrician)* *"It lacks a bit of practice too, you know? Maybe it could be concluded with a workshop, that is, all this material, instead of taking an exam, well, wrap it up with a practical workshop as well". (Woman, 64 years old, paediatrician)*	We included one webinar in each module with the communication skills experts to summarise the content and to solve doubts
Include some specific communication techniques, and training on how to communicate bad news or how to speak in front of an audience	*"In a short workshop I did recently (…) they talked to us about non-violent communication, and they talked to us, first, about the sandwich technique, and then, I don't know if I haven't seen it or if it is there, and I haven't seen it. And the other one they mentioned was one that was like in phases (…), firstly buffering…"I understand so-and-so", then you argue your point, and then you move forward or suggest a solution". (Woman, 41 years old, paediatrician)* *"The thing about speaking in front of an audience and how to give bad news is something that also caught my attention". (Woman, 41 years old, paediatrician)*	We included theoretical content about how to communicate bad news in module 4, and the 'sandwich technique' in the first webinar
Include videos that show communication with families from other cultures	*"Empathy and all this is fine, but then it gets complicated, when they are from other cultures, and it would be good to make a video about this... It would be good to include other cultures as well". (Man, 58 years old, paediatrician)*	We added several videos where communication with families from other cultures was shown
Use this communication skills course for different purposes	*"Maybe one could even take advantage of it, and use it for a course on paediatric clinical interview, that is, how to handle communication better… I feel bad for all the hard work you have put in it, and that you only have the goal of… Because it could have multiple goals".(Woman, 64 years old, paediatrician)*	We considered this option. Maybe in the future we will use the course for further purposes
Include specific theoretical content about infectious diseases	*"Sometimes, doctors with a lack of training think that by giving an antibiotic they are giving better medical attention. There is a lack of training…". (Woman, 64 years old, paediatrician)* *"I guess in the other capsules they talk about things more like…, antibiotics and such: no, yes, when to prescribe them, when not to." (Woman, 47 years old, nurse)*	In module 4, we included specific information about the management of infectious diseases in paediatric primary care: 1) when to demand for complementary exams, 2) when to use rapid diagnostic tests 3) when to refer to hospital, 4) delayed antibiotic prescription
Include information about the safe closure of the visit	*"Also (…) in viral diseases……explain very well the natural history,…, when they have to come back, in case of what,…and the warning signs. (…) Safeguards, taking safeguards". (Woman, 64 years old, paediatrician)*	We included a capsule in module 4 about safe closing of the consultation
Give the professionals accurate information about the duration of the online course	*"What I was telling you at the beginning, to be honest with that part, well, look, for the course (…) you're going to need so many hours to do it, and avoid underestimating, saying less hours than one is going to dedicate in the end". (Man, 52 years old, paediatrician)*	We included an estimation of the duration of the course and accredited the hours of training by an official organism
Change the colors of the platform	*"Maybe I would change the platform colours a bit, to all blue or white". (Woman, 48 years old, paediatrician)*	We changed the color of the moodle platform to a softer blue
Include more exercises or an online forum	*"Maybe more tasks would be needed. I suppose a forum will be opened to comment on the videos among the course participants,… if the students see themselves reflected, if it has ever happened to them…" (Woman, 48 years old, paediatrician)*	We opened a forum in the moodle platform, where users could be in contact with teachers

of the relationship with families was highlighted, with special emphasis on fostering trust in the professional, patient safety and careful closure.

The online modalities of digital education on antibiotic management are more cost-effective than traditional education in improving clinical practice [45]. The pandemic reinforced the need for this format, and the results of the user-testing showed how online courses are well accepted across health care professionals, irrespective of age or field.

The feedback we got from the user testing was overall positive. Content was considered useful and applicable to daily practice, and participants did not find critical problems navigating the platform. Participants believed this course could enhance their communication skills, and contribute to optimising antibiotic prescribing. Participants rated the videos particularly well. Most of the participants in the user testing expressed interest in doing the complete course.

Our study in the context of previous research

Different interventions have been studied as AMS in children, including educational interventions and delayed prescribing. Communication strategies have also been studied as promising strategies that may reduce the risk of antibiotic prescribing for children with viral ARTIs [46]. Educational interventions targeting clinicians and parents, and specifically those related to patient-clinician communication, have shown to be the most effective in reducing antibiotic prescribing in ARTIs [27]. However, most of them only studied a single type of infection [47–53]. Among those that included communication skills training, some targeted only parents [54, 55], and those that targeted professionals were brief workshops, with a maximum duration of two hours [54, 56, 57], or a simulation seminar [58]. Nevertheless, it is challenging to compare communication skills training programs since there is limited data available regarding their design and development.

Strengths and limitations

The main strengths of our study were the rigorous methods used and the comprehensiveness of the training, totalling 25-h and accredited with 3.7 credits. Other strengths were the inclusion of the main players of the antibiotic prescription ecosystem and the online format, that enhances the course's flexibility, implementability, and scalability.

Regarding limitations, the course did not include a practical component; however, we included webinars after each module. Another limitation was the underrepresentation of nurses and pharmacists compared to clinicians. In addition, due to the relatively small sample size (n = 24), it was not possible to conduct statistical comparisons between subgroups of respondents.

Implications for research

Future research could focus on measuring the improvement of communication skills. Online vs. face-to-face workshops could also be compared. Determining whether this type of training leads to improvements in health indicators, such as antibiotic prescription, is another future research challenge. This course has been evaluated as part of a cluster randomized trial in Spain, and the results will be published in the near future [37].

Practice implications

This course is now ready for implementation and to be scaled up. A digital platform is required, and two teachers are needed to conduct webinars, and respond to questions that may arise. For the practical component, face-to-face workshops or synchronous webinars may be conducted. The course can be adapted to other prevalent health problems, as well as be translated into other languages.

Conclusion

We successfully developed a comprehensive online communication skills training course using a rigorous, evidence-based approach to address a critical public health challenge: optimising antibiotic prescribing in pediatric primary care. By integrating key communication strategies and insights from a scoping review, this course provides healthcare professionals with practical tools to enhance shared decision-making and antimicrobial stewardship.

Abbreviations

ARTIs Acute respiratory tract infections
AMS Antimicrobial stewardship

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12875-025-02919-6.

Supplementary Material 1.

Supplementary Material 2.

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Authors' contributions

L.A-A: conceptualisation, methodology, formal analysis, investigation, resources, writing—original draft, visualisation; N.B-B: conceptualisation, methodology, investigation, formal analysis, writing—review & editing, supervision; U.E-A: conceptualisation, formal analysis, project administration, writing—review & editing; A.B-M: formal analysis, investigation, resources, data curation, project administration, writing—review & editing; C.A.R–C: project administration, writing—review & editing; E.N-dG: methodology, formal analysis, data curation, writing—review & editing; F.M.S-J: conceptualisation, methodology, resources, writing—review & editing; F.Q-

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Data availability
The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The OptimAP project was approved by the ethics committee (IDIAP Jordi Gol: 19/019-P). Written and verbal informed consent was obtained for the interviews.

Consent for publication
Written consent for video recording and image use was obtained from all participants in the videos.

Competing interests
The authors declare no competing interests.

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