

Nurses' perceptions of the potential evolution of their role in antibiotic stewardship in nursing homes: a French qualitative study

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Background: In nursing homes, infections and antibiotic prescriptions are frequent. Nursing home nurses (NHNs) and advanced practice registered nurses (APRNs) could promote antibiotic stewardship (ABS). Few studies have explored nurses' knowledge, perceptions and practices towards ABS in nursing homes and none has investigated the potential evolution of their roles.

Objectives: To explore French nurses' perceptions on ABS, current and future potential roles in ABS in nursing homes, as well as facilitators and barriers.

Methods: We conducted a qualitative study in north-eastern France between October 2020 and March 2021 using semi-structured individual interviews with NHNs and a focus group with APRNs. Transcripts of the interviews were analysed using a thematic analysis.

Results: Twenty NHNs and seven APRNs participated. They were aware of antibiotic misuse and potential adverse events but lacked knowledge on some ABS aspects. NHNs' current ABS roles ranged from the detection of clinical infectious signs to clinical monitoring of residents, with some heterogeneity between nurses. They had positive opinions towards playing a more prominent role in ABS. In the future, with additional training, changes in the legislative framework and greater multidisciplinary teamwork, NHNs thought they could prescribe laboratory microbiological analyses and some targeted antibiotic treatments. APRNs thought they could prescribe first-line antibiotics for urinary tract infections.

Conclusions: French NHNs' current ABS roles could be expanded and new roles might be considered while taking into account several facilitators and barriers. According to APRNs, they could help to compensate for the limited presence of doctors in nursing homes and develop infectious diseases skills.

Introduction

Antibiotic resistance, driven by the overuse and misuse of antibiotics, remains a major public health issue.¹ Antibiotic consumption in France has decreased since 2009 but remains above the European average.^{2,3} In France, most antibiotics are prescribed in the community or in nursing homes (NHs).⁴ Characteristics of residents in NHs (e.g. old age, comorbidities) lead to frequent infections and antibiotic prescriptions, with around half of these prescriptions considered unnecessary or inappropriate.^{5,6} According to a nationwide point-prevalence study in French NHs conducted in 2016, 3% of residents were suffering from an infectious disease; the most frequent infections were urinary

tract infections (37%) and lower respiratory tract infections (24%).⁷ In addition, residents are about 40% more likely than their community-dwelling peers to have antibiotic-resistant enterobacteria in their urine.⁸ In line with the recommendations from the WHO,⁹ French authorities have been promoting antibiotic stewardship (ABS) actions among healthcare professionals—including those in NHs—for more than two decades, based on a collaborative and multidisciplinary approach.^{10–12}

Nurses could contribute to prevent antibiotic resistance and should be integrated into multidisciplinary teams in hospital and NH settings. However, their role in ABS has to be clearly defined and quantified.^{13–17} French nurses currently have the following four main roles: patient monitoring, administration of drugs, disease

prevention and education.¹⁸ The advanced practice registered nurse (APRN) status, introduced by a French law in 2018, expanded nursing skills in clinical assessment and therapeutic care (e.g. independent prescription of blood or urinary current biological tests, microbiological analyses and medical imaging exams, renewal/adaptation of existing drug prescriptions), thus modernizing the profession. APRNs are authorized to work in hospital, NH or primary care settings. The 1 year APRN training is accessible to nurses with at least 3 years of experience and included, at first in 2018, three specialties (i.e. controlled chronic diseases, oncological/haematological diseases and chronic kidney diseases).¹⁹ Since then, other specialties (e.g. emergency, psychiatry/mental health) have been introduced in this status and one in geriatric care is currently being considered.²⁰ As in other countries (e.g. USA), APRNs could provide added value for ABS²¹ but to date, they have no official role in this field in France.

Recent studies have been performed to explore nurses' knowledge, perceptions and practices towards ABS in NHs,^{5,22–26} including one in France.⁵ However, none has investigated the potential evolution of nurses' roles in ABS in NHs. In a context where roles of health professionals are evolving, exploring the perception of stakeholders about evolution of their profession is of particular interest.

A qualitative study was performed to explore French nurses' perceptions on: (i) antibiotic use/misuse and antibiotic resistance in NHs; (ii) their current roles towards ABS in NHs; and (iii) their future potential skills and roles towards ABS in NHs, as well as facilitators and barriers to these evolutions.

Methods

Study design

The qualitative study was conducted in one administrative geographical area of north-eastern France (Meurthe-et-Moselle, population of 733 469 according to the 2018 census) between October 2020 and March 2021 using: (i) semi-structured face-to-face individual interviews with NH nurses (NHNs); and (ii) one focus group with APRNs. A qualitative approach was required to explore nurses' perspectives in-depth and to foster the emergence of ideas about new roles in ABS. As the French law about the APRN is recent, we could only include in the focus group newly trained APRNs with only little work experience as such. For this reason, we used the focus group method, rather than individual interviews, which allows comparison of several points of view and then to fuel the emergence of new ideas.²⁷ The study follows the COREQ reporting guidelines (see Table S1, available as [Supplementary data](#) at JAC-AMR Online).²⁸

French context regarding antibiotic prescribing process and ABS in NHs

NHs aim to accommodate elderly people requiring daily support.²⁹ Residents need constant supervision and nursing care, but are medically stable and do not need constant medical care. Most (75%) of the 728 000 French NH residents are women, one-third are older than 90 years, and have neurodegenerative diseases.³⁰ NH residents from north-eastern France (about 50 000³¹) have similar characteristics.³² Paramedical staffing of NHs includes a coordinating nurse (responsible for nursing care organization), several nurses (nursing care) and assistant nurses (hygiene and comfort care). NHs must have a coordinating physician in charge of organization of care but who does not provide direct medical care to residents except in emergencies or epidemic contexts.^{33,34} Residents are usually managed by their own GP who has a private practice and comes into the NH for regular visits or on nurses' request. Due to the absence of

attending physicians on site, NHNs are in the frontline of infectious disease management. Paramedical staff understaffing, especially during the night, and turnover are frequent in French NHs.^{35,36}

Participants and setting

To recruit NHNs, we first contacted by mail the directors of 16 NHs from Meurthe-et-Moselle, selected to ensure a diversity of size, status (public or private) and location (urban, suburban or rural area). In this mail, we presented the study, its objectives and method, and asked for participation (and to return a written response if so). We then contacted by phone the NHs that agreed to participate in the study to recruit nurses, with a planned final sample target of 20 participants. This sample size generally allows data saturation to be reached,^{37,38} defined as 'the point at which additional data do not lead to new emerging themes'.³⁹

To recruit APRNs, we asked the University Hospital of Nancy to inform recently graduated nurses about the study. APRNs volunteering to participate were invited to contact the research team by mail. We planned to perform one focus group with six to eight participants.

Data collection

To conduct the interviews, two interview guides [one for individual interviews with NHNs (Document S1) and one for the focus group with APRNs (Document S2)] were developed by a multidisciplinary team composed of one nurse and PhD student in public health (C.B.), one public health specialist (N.T.), one epistemologist (G.L.D.) and a healthcare project manager (S.B.). The guides were composed of open-ended questions exploring participants' perceptions regarding the three following topics: (i) their knowledge and beliefs about antibiotic use/misuse and antibiotic resistance; (ii) their current roles in ABS; and (iii) the potential evolution of their skills and roles towards ABS, including facilitators and barriers to these evolutions. At the end of the interview, participants completed a short questionnaire on their sociodemographic characteristics (Documents S3 and S4).

At first, we planned to conduct face-to-face individual interviews with NHNs in the NH premises. Due to the COVID-19 pandemic, half of interviews were conducted by phone or video conference. Interviews (expected duration: 1 h) were conducted by one nurse/PhD student (C.B.) and one epistemologist (G.L.D.) trained in qualitative research.

The face-to-face focus group with APRNs (expected duration: 1 h 30 min) was conducted by C.B. and G.L.D. using the focus group method.⁴⁰

After oral consent, individual and collective interviews were recorded and transcribed. Participation was voluntary and not compensated.

Analysis

A thematic analysis by an inductive method was used to separately analyse transcripts from individual interviews and the focus group. Using Microsoft Excel, two analysis grids (one for individual interviews and one for the focus group) were designed by the nurse/PhD student (C.B.) and validated by the epistemologist (G.L.D.) and the senior public health specialist (N.T.). Each theme and subtheme were discussed until a consensus was reached. Two written reports were produced to present analytical themes and the most illustrative verbatims.

Ethics

This study was granted approval by the ethics committee of the University Hospital of Nancy on 15 October 2020 (approval No. 287).

Results

We conducted 20 individual interviews with NHNs recruited in nine different NHs (average duration: 49 min), which allowed us

Table 1. Characteristics of the nurses who participated in the study

Participants in the individual interviews ^a (N=20)		Participants in the focus group (N=7)	
Characteristics	N	Characteristics	N
Personal and professional characteristics		Personal and professional characteristics	
Sex		Sex	
Female	19	Female	6
Male	1	Male	1
Age (years), range		Age (years), range	
18–24	1	18–24	0
25–34	3	25–34	2
35–44	8	35–44	3
45–54	5	45–54	1
55–62	3	55–62	1
Number of years of practice, range		Number of years of practice as nurse, range	
<5	3	<5	0
5–9	6	5–9	2
10–19	5	10–19	3
≥20	6	≥20	2
Profession		Number of months of practice as APRN, range	
Nurse	13	0–2	4
Coordinating nurse	7	3–5	1
Number of years of practice in nursing homes, range		6–11	0
<5	10	≥12	2
5–9	4	Work place before APRN training	
10–19	5	Public regional centre	5
≥20	1	Private clinic in an urban area	1
Recent training in IPC/infectious diseases ^b	0	Self-employed practice	1
IPC training in the last 3 years	4	Work place after APRN training	
Characteristics of the nursing home of exercise		Public regional centre	5
Location		Medical centre	1
Rural	6	Self-employed practice	1
Suburban	6	Experience in geriatric care	
Urban	8	Nurse in a hospital geriatric unit	1
Status		APRN internship in NHs	2
Public with connection to an hospital	8	No experience	4
Public without connection to an hospital	5	APRN speciality ^c	
Private	7	Controlled chronic diseases	4
Capacity (number of beds), range		Oncological pathologies	2
<80	7	Chronic kidney diseases	1
80–100	11		
>100	2		

^aIn the context of the COVID-19 pandemic, eight participants were interviewed by phone and three by video conference; other interviews were conducted face to face.

^bTraining in IPC or infectious diseases <1 year.

^cControlled chronic diseases: controlled chronic diseases and common multiple diseases in primary care; oncological pathologies: oncological and onco-haematological pathologies; chronic kidney diseases: chronic kidney disease and end-stage kidney disease (dialysis, kidney transplantation).

to reach data saturation as no new themes emerged after the seventeenth interview. All but one participant were women, and 8/20 were 35–44 years old. Most participants (13/20) were nurses, and the others were coordinating NHNs. They had various experience levels as nurses but half had been working in a nursing home for less than 5 years (Table 1).

Seven APRNs participated in the focus group (duration: 1 h 40 min), including six women (Table 1). Three had experience in geriatric care and the three APRN specialties were represented.

The main findings are presented separately for NHNs and APRNs, and by themes and subthemes arising from the analysis.

NHNs' views on antibiotic use/misuse and adverse events (see Table S2)

The definition of appropriate use and misuse of antibiotics given by NHNs was heterogeneous, but mainly referred to prescription. Most participants described appropriate use as 'good antibiotic prescribing practices'. For half of the participants, antibiotic misuse is mostly due to prescriptions without clinical evidence or microbiological analyses, which would increase the risk of inappropriate antibiotic choices. Few estimated that it is necessary to wait for the results of the microbiological analyses before prescription. A few other NHNs also mentioned the use of antibiotics for viral infections as a misuse practice.

Regarding potential consequences of antibiotic use/misuse, most participants cited bacterial resistance, resulting from antibiotic overuse and self-medication; they feared that antibiotics will become ineffective, but did not know the molecules at higher risk of resistance. Likewise, the difference between empirical and targeted antibiotic treatment was not always known by the participants.

Most participants reported that residents' characteristics (i.e. age, poor health) influence the risk of infectious diseases, their diagnosis and management and increase the risk of antibiotic misuse. They experience difficulties regarding antibiotic administration and often need to adapt the drug formulation due to residents' swallowing disorders, refusal or cognitive impairment. For half of the participants, mental disorders also impair the interpretation of the clinical infectious signs.

NHN's views on their ABS actions at different stages of residents' care (Table 2)

NHNs reported participating in ABS actions at different stages of residents' care. When a resident presents clinical signs compatible with an infection, most participants perform a clinical assessment and, if they deem it necessary, inform the GP by phone. If the GP prescribes microbiological tests, all participants collect the samples and manage their follow-up. However, when facing a suspected urinary tract infection, many participants first perform a dipstick screening test. In case of a positive result, they collect a urine sample and send it to the laboratory for culture on their own initiative without waiting for the medical prescription. The urine culture is then prescribed *a posteriori* by the GP. In the case of positive results, most participants contact the GP for guidance.

When a GP decides to prescribe an antibiotic, only a few NHNs discuss with them the relevance of the antibiotic treatment and potential allergies. Most participants then prepare antibiotics for the resident and help them in taking them or delegate this task to assistant nurses, as provided by French law.⁴¹ During the treatment, most NHNs monitor antibiotic effectiveness, about half also monitor adverse events (especially digestive disorders) and ensure that the resident takes the drugs appropriately; only a few ask the GP to adapt the drug formulation, if they deem it necessary to facilitate administration.

Most participants acknowledged that patient education is limited in NHs, mainly due to residents' mental disorders. Nurses provide information about the antibiotic treatment to residents who are able to understand it and to relatives, who often ask for such treatments they perceive to be the solution.

NHNs' perceptions towards the development of their skills and roles in ABS (Table 3)

Most participants had positive perceptions towards the development of their skills and roles in ABS. Perceived benefits included time saving and greater independence in the management of residents with a suspected infection. However, a few participants also reported some risks (e.g. risk of error, misuse).

NHNs' roles to develop or perform in the current legislative context (Table 3)

For half of the participants, NHNs could not do more regarding ABS. However, a few NHNs wished to develop or more frequently perform some of their current authorized tasks not regularly realized to date. They mentioned in particular: performing urine dipstick screening tests from their own initiative; training assistant nurses on urinary tract infection prevention and in assisting the resident in taking antibiotics; tracing the antibiotic administration in the resident's file; monitoring the resident during the treatment; discussing with the GP about the antibiotic prescriptions; participating in the choice of the drug formulation; checking the potential allergies and the prescription (drug, dose, duration); and expanding their role in prevention, e.g. education and infection prevention and control (IPC) measures. Some participants would like to develop their skills in clinical evaluation in order to be able to analyse and discuss the situation with the GP.

Regarding potential new roles, some participants suggested they could propose to the GP the evaluation of the appropriateness of the empirical antibiotic therapy (i.e. the possibility to switch from the IV route to the oral one) after receiving the results of the antibiotic susceptibility testing report. They also suggested production, with pharmacists and GPs, an annual summary report about infections, microbiological investigations, antibiotic resistance and antibiotic use, to improve the quality of the resident care.

NHNs' roles to develop without taking into account the current legislative context (Table 3)

Most participants would like to prescribe the laboratory microbiological analyses, especially the urine cultures, and half the blood tests too. A few participants wished to be trained to perform pulmonary clinical examination to detect pulmonary infection.

Half of the participants proposed prescription of antibiotics for some infections (urinary tract, pulmonary and skin infections) after receiving the results of the antibiotic susceptibility testing report and to choose the drug formulation. A few participants also proposed prescription of physiotherapy and complementary IPC isolation precautions.

Facilitators and barriers to the evolution of NHNs' skills and roles in ABS (Table 4)

Most participants identified the need for additional training as a facilitator to the expansion of their ABS roles. According to them, it should focus on infectious diseases (pathophysiology and microbiology), antibiotic prescription and pharmacology, appropriate use of antibiotics, and how to perform a pulmonary examination. Nurses' experience-based knowledge should help

Table 2. Selection of the most illustrative verbatim examples regarding NHNs' views on current roles in ABS

Theme	Subtheme	NHN	Verbatim
Actions at different stages of resident care	Clinical assessment	NHN 13	<i>'First, she [the nurse] is the main actor of the observation of the patient, I mean. If there is a change in his/her behaviour, if there are symptoms that appear or disappear, it is still the nurse who will know how to see them and report them to the GP.'</i>
	Collecting microbiological samples	NHN 5	<i>'Often, regarding urine cultures, we take the initiative ourselves to take a sample, then we tell the doctor to write the prescription and usually, that's how we do it. We don't wait for the doctor to come to us to do a urine culture.'</i>
	Role in medical prescription of antibiotics	NHN 14	<i>'Check that there are no allergies, that the antibiotic is correctly prescribed, that it is adapted to the resident's state of health [...] The nurse exchanges with the GP, participates in the discussion when s/he prescribes and when s/he chooses the antibiotic.'</i>
	Medication management	NHN 10	<i>'When we can't manage to administer, it's true that we have already called the doctor back to tell him/her and eventually, we change the antibiotic, we change the drug formulation'</i>
	Resident monitoring	NHN 7	<i>'Ensure that the antibiotic is taken. Check for any adverse events, mainly skin and digestive effects, which are the most common here. And if there's any evolution, if there is no more fever.'</i>
	Education	NHN 12	<i>'We explain to the resident the reason for the antibiotic, when s/he is able to understand, which is not always the case for most of our residents.'</i>

Table 3. Selection of the most illustrative verbatim examples regarding NHNs' views on potential future skills and roles in ABS

Theme	Subtheme	NHN	Verbatim
Perceptions towards the development of their skills and roles	Positive perceptions	NHN 4	<i>'I think it's great that nurses can expand their skills [...] they're also the most able to assess the situation and, as I said earlier, waste less time, less chance on the resident by immediately putting in place what is needed.'</i>
	Negative perception	NHN 11	<i>'There is a greater risk of misuse.'</i>
Roles to develop or perform in the current legislative context	Assistant nurses' training	NHN 2	<i>'I think we should do a little training [of nursing assistants in assisting the resident in taking antibiotics], maybe a little hour, two hours [...] if the resident is not compliant.'</i>
		NHN 11	<i>'Because as soon as we are understaffed, if we trace our care, we can't do all our care.'</i>
	Prescription and administration	NHN 8	<i>'Regarding the prescription, we could perhaps work in collaboration with the GP on what we recommend, on what is adapted to the resident in terms of drug formulation, to take stock of prescriptions, the allergies when prescribing.'</i>
		NHN 15	<i>'Participate in data collection and analysis, especially with the pharmacist, to say which type of antibiotic therapy was used for which disease and possibly make an annual summary report.'</i>
Roles to develop without taking into account the current legislative context	Clinical assessment	NHN 3	<i>'I would like to be trained to do a lung auscultation. I think that we're able to do this, that we would be able to do this. It doesn't sound too complicated.'</i>
	Biological sample prescription	NHN 10	<i>'Directly prescribe the urine cultures, tests or a blood test.'</i>
	Antibiotic prescription	NHN 5	<i>'Take the initiative to use an antibiotic, for example if I knew how to read an antibiotic susceptibility testing result, [...] no need for a GP.'</i>

them to develop their skills in ABS. Half of the participants also cited the legislative framework, essential to secure nurses' actions. Some participants reported that some tools such as antibiotic

guides, protocols, computerized care records or telemedicine would facilitate the development of new roles. Finally, a few participants identified multidisciplinary teamwork (GP, pharmacist,

Table 4. Selection of the most illustrative verbatim examples regarding NHNs' views on facilitators and barriers to the evolution of skills and roles in ABS

Theme	Subtheme	NHN	Verbatim
Facilitators	Training	NHN 13	<i>'We should be trained. Yes, I think in terms of pharmacology, we should go through each class of antibiotics and what they are used for [...] and then the appropriate use.'</i>
	Tools	NHN 20	<i>'Types of procedures, clinical cases, you have such a sign, such a symptom, this is what kind of protocol you can put in place [...] A guide to the use of antibiotics, why not?'</i>
	Multidisciplinary teamwork	NHN 13	<i>'It's [the appropriate use of antibiotics] at all levels. I've already talked about the prescriber, so the GP who's still the guarantor of all this. The pharmacist who will deliver the treatment to the care service. The nurse, of course. The assistant nurse also.'</i>
	Implementation of APRNs	NHN 19	<i>'We're currently thinking about advanced practice registered nurses. And it seems logical to me that those who choose more pharmacology-oriented functions could perhaps have transversal roles in their structures.'</i>
	Legislative framework	NHN 20	<i>'Legally, perhaps something should be changed. In the decree directly, in the decree of competence.'</i>
Barriers	Lack of information/knowledge	NHN 10	<i>'I think that we're not informed enough, for example on antibiotics, well, trained and informed, in fact, because finally, since I graduated, I learned antibiotics when I was at school and then finally, we're not told if there are new antibiotics that come on the market, if there are some that are less used. In fact, we find out as we use them.'</i>
	Lack of time	NHN 13	<i>'First of all, the lack of time, clearly because nurses are overworked, they already have many roles to manage.'</i>
	GPs' opinion	NHN 3	<i>'I know two or three [GPs], frankly wouldn't like that at all. Getting test results in their office when they haven't prescribed them themselves, I don't think they would like that.'</i>

IPC nurse and assistant nurse) and the implementation of APRNs in NHs as facilitators.

Perceived barriers to complete additional roles in ABS included the lack of information/knowledge about antibiotics, the lack of time and human resources, and the frequent interruptions in the nurses' workflow. Some participants also feared the GPs' unfavourable opinion regarding the expansion of their roles in ABS. They thought that GPs would not have confidence in their skills to carry out these roles and would prefer to continue to perform these roles themselves.

APRNs' views on antibiotic use/misuse, antibiotic resistance and roles in ABS (Table 5)

Participants were aware of the appropriate use of antibiotics and antibiotic resistance. They defined misuse as an inappropriate prescription and non-compliance with the instructions for taking antibiotics (e.g. time intervals). They were aware of antibiotic adverse events (e.g. resistance, digestive disorders, skin reactions, renal failure) and paid great attention to them in managing patients because they could reduce the patient adherence to treatment.

APRNs act as a relay between GPs and NH residents. Their skills in clinical evaluation allow them to analyse the resident's situation with a suspected infection, assess the degree of emergency and suggest guidance. They can prescribe some laboratory microbiological analyses too (e.g. urine cultures, skin/mucosal swabs, peripheral venous blood cultures) defined by a decree.⁴² APRNs also participate in discussions with GPs and pharmacists about the appropriateness and the specifics of antibiotic prescriptions (e.g. administration route, drug formulation, dosage, risks for drug interactions). They are involved in resident education,

and monitoring of the antibiotic treatment, and alert the GP, if they deem it necessary, to modify or stop the treatment.

APRNs favoured expansion of their ABS roles, especially to develop prevention roles, prescribe more laboratory biological analyses and first-line antibiotic treatments for urinary tract infections. The main facilitator for change they mentioned was their APRN training. However, participants highlighted that this new status must be accepted by other health professionals, in particular by GPs, perceived to have some negative perceptions towards APRNs.

Discussion

Our results identify the current key role of NHNs in ABS, ranging from detection of infectious clinical signs to clinical monitoring of residents. The participants were aware of the misuse of antibiotics and their potential adverse effects, including antibiotic resistance, but lacked knowledge of some aspects of ABS. They had a positive view of the development of their skills/roles in ABS.

In the future, with training, changes in the legislative framework and better multidisciplinary teamwork, NHNs thought they would be able to prescribe microbiological laboratory tests and some targeted antibiotic treatments. NHNs proposed new roles that corresponded to the core elements of ABS (e.g. evaluate the appropriateness of the empirical antibiotic therapy and monitor antibiotic consumption) commonly implemented in our region according to Belan et al.¹² APRNs believe they can prescribe first-line antibiotics for UTIs. We can notice that NHNs/APRNs only thought about patient-centred missions but not about more collective missions such as the promotion of ABS programmes, although they might have a role to play.

As in many other countries,^{14,16} NHNs' current ABS roles include clinical assessment and, under medical prescription,

Table 5. Selection of the most illustrative verbatim examples regarding APRNs' views on antibiotic use and their role in ABS

Theme	Subtheme	APRN	Verbatim
Antibiotic use/misuse and adverse events	Appropriate use of antibiotics	APRN 1	<i>'First of all, we have to look, know what we are administering, know what we are prescribing, at least for the prescriber, know the indications, is it prophylactic antibiotics? Will it be curative? Know the molecules...'</i>
	Antibiotic misuse	APRN 7	<i>'Untimely prescription or otherwise [...] outside of an infectious episode, which is not necessarily great.'</i>
	Antibiotic adverse events	APRN 2	<i>'With some antibiotics, there are digestive side effects that are so uncomfortable for the patient [...]. This is just not acceptable.'</i>
	Antibiotic resistance	APRN 1	<i>'I worked in geriatric medicine [...] antibiotics were a big problem because patients developed resistances [...] and when they had several resistances, it was difficult to treat them.'</i>
APRNs' role in ABS	Relay between patients and GPs	APRN 3	<i>'[...] there is rarely a doctor on site. It is very rare so s/he [the APRN] will really be the connection.'</i>
	Advisory role	APRN 7	<i>'Sometimes have an advisory role with GPs and pharmacists'</i>
	Clinical evaluation	APRN 1	<i>'The APRN can also examine [patients] [...] So, at the lung level, check for infection.'</i>
Potential evolution of APRNs' role in ABS	Prescription	APRN 2	<i>'Typically, the patient comes in with a urinary tract infection and the first resort is [...] it's our job to prescribe the antibiotic.'</i>
	Prevention	APRN 1	<i>'I think in the future, we will have some prevention, well, the general public, it will be very important.'</i>
Facilitators and barriers	Role of collaboration	APRN 2	[Interviewer: <i>What conditions should currently be in place to enable you to carry out your new roles as APRN or the intensification of your nursing roles?'</i>] <i>'Reaffirming our collaborative role with the different health actors.'</i>
	GPs' opinion	APRN 2	<i>'The biggest barrier to the implementation of APRNs, it is still the GP.'</i>

sample collection, follow-up of analyses, treatment preparation, administration and monitoring of potential adverse events. However, we observed some heterogeneity in NHNs' ABS roles, as already found by Schweitzer *et al.*⁴³ about urinary tract infection management in Northern Ireland. Our results suggest that this comes from variability in NHNs' individual opinions and practices as well as NHs' contextual factors (e.g. pharmacy access, GPs' opinions). In particular, many NHNs reported taking and sending a urine sample to the laboratory on their own initiative after a positive dipstick test, without any clinical examination of the resident by their GP. Indeed, the dipstick test is doubtful to solely guide the diagnosis strategy of urinary tract infections and can lead to an overuse of antibiotics.⁴⁴

French evidence-based guidelines dedicated to ABS in NHs can improve this situation,¹² as well as the French '2022–2025 National Strategy for Preventing Infections and Antibiotic Resistance', which mentions the implementation of core ABS elements in NHs.¹¹ Regional health authorities and regional ABS networks could implement these elements.¹² Potential forms of evolution could be achieved by the involvement of NH administrators, who should enhance and promote ABS practices²² and organize them, taking into account the NHN's central role in routine patient care.⁴⁵

In the future, NHNs thought they could have a prescriptive role. This would require evidence in terms of quality and safety of resident care and changes in the French legislative framework. As mentioned by participants and in previous findings,^{6,46} new roles would also require additional training on all main aspects of infection management (e.g. clinical infectious signs, indications for microbiological investigations, antibiotic management)

and in-depth knowledge regarding the appropriate use of antibiotics.^{22,23,46}

Regarding facilitators, NHNs also mentioned their involvement in multidisciplinary teamwork (e.g. with GPs, pharmacists and microbiologists), which plays a prominent role in ABS,⁴⁵ as already reported. This may be done through regular interdisciplinary meetings^{47,48} and use of shared tools (e.g. protocols, guidelines) to guide infection management.⁴⁹ Many tools available on the web target the NHNs' practice and could be used to improve ABS. For example, tools for resident evaluation and reporting by the nurse to an off-site physician may avoid unnecessary antibiotic prescriptions.⁵⁰ However, this requires that NHNs are made aware of existing national or regional ABS initiatives, infection training and tools.¹²

One of the main obstacles for these potential future roles, mentioned by the majority of participants, is the lack of time. In a context of increasing workload without additional human resources and significant staff turnover,⁵¹ this lack of time currently prevents them from completing their ABS roles. Conversely, as reported elsewhere,⁵² they also acknowledge that being able to prescribe antibiotics could help them save time, currently spent in contacting and waiting for GPs' diagnostic and therapeutic decisions.

Finally, the new APRN status is an opportunity to improve the organization and the quality of resident care in NHs,⁵³ provided agreement is obtained from all health professionals on this new scope of practice of APRNs, which is not yet well known to allow optimal collaboration.⁵⁴ Previous investigations showed that APRNs' expanded skills enable them to analyse the results of microbiological analyses (e.g. differentiate colonization from an infection),¹⁷ prescribe antibiotics only when necessary, and

educate patients on antibiotic use.⁵⁵ These skills could allow APRNs to be ‘infection specialist nurses’ in NHs, as suggested by Sloane et al.⁵⁶ As such, they might be involved in several ABS roles in NHs (e.g. monitoring of antibiotic prescriptions, cultures and results)⁵⁶ and be a resource for nursing staff when GPs are not available.⁵⁷ However, given the current low number of APRNs in France, training NHNs to become ‘infection specialist nurses’ could make it possible to deploy this skill more widely.

Strengths and limitations

This study provided a broad view of NHN’s perceptions about their involvement and the potential evolution of their roles towards ABS. Including APRNs in the study allowed the opportunities offered by this status recently introduced in France to be explored. We used various qualitative methods; for each group of professionals, we chose the best method to facilitate the emergence of ideas. This study generated concrete propositions that might be explored to improve ABS in NHs.

This study had also some limitations. NHNs and APRNs who agreed to participate were probably more interested in ABS and more favoured the evolution of their roles in this field than those who declined, generating a selection bias. However, our goal was not to obtain a representative picture of the NHNs’ perceptions. Besides, as the APRN status was recent, few APRNs have been trained, and only one focus group could be conducted for feasibility reasons. Thus, we could not assess whether data saturation was reached. Further studies should be conducted to confirm our results among APRNs. Moreover, half of APRNs interviewed had no previous experience in geriatric care. Finally, due to the COVID-19 pandemic, we had to conduct interviews by phone instead of in face-to-face; expression could be facilitated less by phone.⁵⁸

Conclusions

Reinforcing the participation of nurses in ABS in NHs is needed. The first step is to make sure NHNs can invest more optimally in their current ABS roles. It is necessary to make NH ABS guidelines available, promote NHNs’ ABS roles, provide them with training and tools regarding infection management, and reinforce the multidisciplinary work. Future roles identified in the present study might also be explored: (i) a quantitative questionnaire survey is ongoing to submit the main roles to a representative sample of French NHNs to assess their acceptability and feasibility; (ii) experiments will then be needed to evaluate their impact on patient care and safety. These results are of particular interest in the French context, where the role of nurses is evolving, but also for NHs abroad where the organization of resident care is a major concern in the fight against antibiotic resistance.

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Author contributions

C.B., C.P. and N.T. conceived the project. C.B., G.L.D., S.B. and N.T. developed the interview guide. C.B. and G.L.D. collected the data, elaborated the analysis grid and coded the interviews. C.B., G.L.D., A.B. and N.T. interpreted the results. C.B., G.L.D. and N.T. drafted the first version of the manuscript, which was reviewed by all authors.

Transparency declarations

None to declare.

Supplementary data

Tables S1 and S2 and Supplementary documents S1–S4 are available as Supplementary data at JAC-AMR Online.

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